Summary 111

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Cover crop management in a Chardonnay/99 Richter vineyard in the coastal wine grape region, South Africa. 2. Effect of different cover crops and cover crop management practices on grapevine performance"

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In a previous study, these same authors studied which cover crop/cover crop management combination provided the *best weed control.* In the second part of their study, the authors look at the impact of the different cover crop/cover crop management combinations on *vine performance* (shoot growth, petiole nutrient status and yield).

• The treatments compared are the same as previously described (See *Summary 90*). Briefly, there were 8 cover crop species that were sown in October (Northern hemisphere): 1) rye (*Secale cereale*), 2) 'Overberg' oats (*Avena sativa*), and 3) Saia oats (*Avena strigosa*). The broadleaf, N-fixing species were: 4) grazing vetch (*Vicia dasycarpa*), 5) faba bean (*Vicia faba*), 6) 'Paraggio' medic (*Medicago truncatula*), 7) 'Kelson' medic (*Medicago scutellata*), and 8) subterranean clover (*Trifolium subterraneum*). There were 2 cover crop management practices: 1) chemical elimination of cover crop before vine budbreak (which we will call BB), and 2) chemical elimination of cover crop after budbreak, which allows the cover crop to to complete its life cycle (AB). There were also 2 controls: 1) no cover crop sowed and weeds controlled mechanically at the end of the growing season (Control-MECH), and 2) same as above but with weeds controlled chemically (Control-CHEM). There were a total of 18 treatments (8 species x 2 practices + 2 controls), and 3 replications per treatment [*that's quite a lot of experimental subplots!*]

• **Effect on shoot growth.** The young vine **shoot mass was highest when cover crops were eliminated at budbreak** (BB treatment), compared to when cover crops were eliminated at the end of their cycle (AB treatment), or still when no cover crop was sowed and weeds were cultivated mechanically (Control-MECH). This indicated that cover crops enhanced performance of vines in medium-texture soils if controlled chemically before budbreak. In contrast, if cover crops were left to complete their cycle (AB), they had a negative effect on grapevines (up to 60-80% growth reduction, compared to Control-CHEM). In fact, **minimum cultivation with post-emergence chemical control before budbreak, combined with 'Paraggio' medic as cover crop, was the most effective soil management practice for young vineyards** (2 yr-old) to enhance the development of permanent structures.

• As vines became mature and full-bearing, the impact of soil management practices was less important. In fact, the BB treatments, combined with N-fixing cover crop species, tended to over-stimulate shoot growth in this type of medium-texture soil, with the danger of creating dense canopies. 'Kelson' medic, in particular, stimulated shoot growth so much that the authors concluded that it should not be used continually in the long term. As a result, **a cereal cover crop, combined with chemical control at budbreak, was the preferred soil management practice for mature vines in the long run.**

• **Effect on yield.** In agreement with the above results, N-fixing cover crop species had a positive impact on yield in young grapevines when cover crops were controlled at budbreak. However, when left to complete their cycle, yield was reduced from 30-47%. Even when yield was affected by treatment, berry size was not.

•**Effect on petiole analysis.** Nitrate nitrogen (NO3-N) in petioles indicated that grapevines in the Control-MECH and Control-CHEM, as well as in cover crops left to complete their cycle (END), were slightly under-supplied with N from budbreak to bloom.This was attributed to competition from summer-growing weeds proliferating in the above treatment from budbreak to when berries reached pea size. On the other hand, NO3-N in petioles of the BB treatment combined with 'Kelson' medic was much higher than petiole levels when no cover crop was sowed, indicating a slight over-supply. The authors linked this luxurious supply of N during the early growing season with the excessive shoot growth they had observed. The authors concluded that, under the conditions of this study, **N-fixing species should not be used continuously as cover crops, as they may lead to early season over-supply of N**.

• **Effect on juice and resulting wine.** Sugar content of the juice of the BB treatments of the different cover crops tended to be lower than the corresponding END treatments, or than both controls. Similarly, acidity for the BB treatments tended to be higher, and pH lower. These results were attributed to differences in crop size in the different treatments, as well as in vegetative growth. In agreement with petioles, the N concentration in the juice of vines in the 'Kelson' medic/BB treatment (as well as in other N-fixing species like 'Paraggio' medic, subterranean clover and faba bean) was significantly higher, indicating N over-supply from flowering to harvest. This, as we know, may encourage microbial instability and ethyl carbamate formation in the wines. When wines (20 liter) from the different treatments were subjected to a 14-member experienced tasting panel for evaluation of overall quality, aroma and taste, the panel was unable to detect any differences.

• **Recommendations**:
_ In the case of *young vines*, the annual sowing of a cover crop (preferably 'Praggio' medic), in combination with post-emergence chemical control, was found to be the best soil management practice.
_ In the case of *mature vines*, although N-fixing species were beneficial to the grapevines initially, they should be rotated with cereals after approximately 4 years, to avoid the risk of excessive N supply.
_ Finally, in either case –young or mature vines-, a cover crop, combined with chemical control before budbreak resulted in better vine performance than the use of chemical or mechanical weed control and no cover crop.

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