



“Influence of vineyards floor management practices on grapevine vegetative growth, yield, and fruit composition”

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- Maintaining a floor cover under vines has produced conflicting results when it comes to vine behavior. In certain cases, grape quality can be improved. But in certain others, particularly in dry areas, cover crops have been associated with off-wine flavors, or had to be abandoned as “unsustainable”. This paper compares the benefits –or lack thereof- of a cover crop in two different climates: a hot-dry climate and a mild, semi-humid climate.
- For 4 seasons, and in 2 very climatically-distinct Chardonnay vineyards, which we will call **Dry** vineyard and **Humid** vineyard, the authors compared the following types of floor cover management:
 - 1) **Bare** : no cover crop through the use of systemic herbicides;
 - 2) **Partial** cover: permanent resident vegetation in interrows, and 100 cm wide strip under vines kept bare. (Mowing regime: 3-4 times per season).
 - 3) **Complete** cover: no bare strip under vine. (Area under vines mowed with hand-operated lawn-trimmer).
- The trial was a randomized block design, with 12 replicates of 5 vines (Dry vineyard) or 4 vines (Humid vineyard) in each replicate. All treatments received the same amount of irrigation within each vineyard (which was an average of 1.8 ml/ha for the Dry Vineyard, and 0.5 ml/ha for the Humid Vineyard, less dependent on irrigation).
- The authors monitored soil water content by placing neutron probes in 4 positions: inrow underneath the drip emitter, inrow next to the vine, in the interrow 50 cm away from the vine (wheeltracks), and in the middle of the interrow (150 cm from the vine). They also monitored many other parameters, including soil and plant nutrients, vegetative growth, and fruit chemistry.
- **Effect on soil moisture . Increasing floor cover led to lower soil moisture .** Soil moisture in the Dry vineyard showed much variability, compared to the Humid vineyard, probably related to the coarse sand texture and the low field capacity of the former. In the Dry vineyard, there was also an interesting reversal of trends observed at the 90 cm (35.5 in) depth: at this depth the complete cover treatment had more moisture than the bare treatment, unlike what was the case at 30 cm (11.8 in) depth. For both vineyards, positions in the *inrow* -both under the emitters and next to the vine- had more moisture than those in the *interrows*.
- **Effect on soil composition.** There were few effects of floor treatment on soil composition. After 3 years into the trial, there was more phosphorus and the soil pH was more acidic under the complete cover treatment, compared to the bare treatment. In agreement with what was expected based on climate, there was more organic carbon (organic matter) in the Humid than in the Dry vineyard. Still, the authors could not observe an effect of floor cover treatment on the amount of organic carbon.

• **Effect on petiole analysis.** There was some effect of floor cover treatment on levels of petiole Cu, Na, and K, but differences were small and not present in every season. The main effect was on **petiole nitrogen and magnesium**, which were **significantly lower in the complete cover than in the bare treatment**, in both vineyards.

• **Effect on vegetative growth.** 1) Floor cover had some slow-down effect on phenological stages. With bare soil, bloom occurred 5 days earlier (Humid vineyard), whereas **with complete cover, veraison was delayed** by 4 days (Dry vineyard). 2) Shoots on bare soil and partial cover grew considerably faster than in complete cover, in the Dry vineyard (early season vigor was the same in the Humid vineyard). As a result, **shoot length decreased with increased floor cover**. Accordingly, pruning weights also decreased. 3) Vines on bare soil had the densest-looking canopies, whereas **vines with complete cover had more open canopies**. This was further proved by canopy measurements (percent gaps, leaf layer number, percent internal clusters, percent internal leaves), which were completely different in the complete cover compared to the other two treatments. Complete cover also had fewer leaf layer number and internal clusters than partial cover.

• **Effect on yield and fruit composition.** At both locations, there were no differences in the first two seasons. However, in the third and fourth seasons, **complete cover had lower yield, lower cluster number, and lower berry weight than the other treatments**. As for fruit composition, Brix was lowest in the bare soil treatment and highest in the complete cover, but this was only observed by the fourth season, and only in the Dry vineyard. Floor covers did not affect Brix in the Humid vineyard. TA and pH changes were inconsistent in the Dry vineyard, but in the Humid vineyard, TA tended to be highest in the bare soil, followed by the partial cover.

• In their discussion, the authors offer some recommendations on how to overcome the yield-reducing effects of a cover crop:

- 1) keep cover mowed, which decreases water use;
- 2) use species that are not characterized by intensive spring growth;
- 3) use mulches, which provide the highest soil moisture conservation of all floor covers;
- 4) use drought-tolerant rootstocks, to reduce competition; and
- 5) initiate irrigation earlier in the season, or increase water amounts during critical stages (bloom and fruit set). *[Editor's note: The authors are probably suggesting this to combat a situation where there is an important yield drop due to an aggressive cover crop. But let's keep in mind that recent research in irrigation suggests that early water stress is key to achieving best grape quality]*

In conclusion, increased floor cover led to lower soil moisture, which in turn caused more open canopies, lowered yields, and increased fruit maturity. These effects were site-dependent, and they were particularly striking in Chardonnay vines grown under sward in the warm, dry site. On the other hand, in the author's opinion, it would be too simplistic to recommend bare soil in hot, arid environments, as there could be unintended effects due to the use of herbicides (such as the documented decrease in soil microorganisms). Instead, the authors recommend practices that can compensate for the less glamorous sides of a cover crop, such as using less competitive species, mowing them readily, using drought-tolerant rootstocks, and irrigating earlier.

(Continued)

Effect of increased floor cover on:

	Dry hot site	Humid mild site
Soil moisture	↑ (at 90 cm depth) ↓ ↓	↓
Soil composition	↑ phosphorus ↓ pH	
Petiole analysis	↓ nitrogen ↓ magnesium	
Phenological stage	Veraison delayed	Bloom delayed
Shoot growth rate	↓	-
Shoot length	↓	
Pruning weights	↓	
Canopy openness	↑ ↑	↑
Yield	↓	
Cluster number	↓	
Berry weight	↓	
Brix	↑	-

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