

# Improving under vine soil with living mulches

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## Living plants instead of herbicide

For growers looking to reduce herbicide use on their vineyards, under vine living mulches are an attractive alternative. Living mulches are a type of cover crop which share their growing season with the main crop. They have the potential to improve soil function by increasing soil carbon (C), water infiltration and water storage capacity and improving the resilience of soil structure. Their effects are likely to vary based on soil type as well as quantity and species of living mulch, however little information exists to guide

growers in managing living mulches on different soils and in a cool climate.

This study investigated the following questions on two distinct soils:

- How do living mulches affect soil organic C, the resilience of the soil structure and soil water storage and infiltration?
- What is the relative importance of living mulch dry matter from the current and previous seasons on the soil qualities listed above?
- Does quantity of dry matter or species composition of the living mulch matter?

## On farm trials

A four-year trial was established on a vineyard in the Coal River Valley in 2020 with three under vine treatments:

- A legume living mulch (Burr medic and Subterranean clover)
- A legume and grass living mulch (Burr medic, Subterranean clover and Cocksfoot cv. Sendace)
- Bare soil achieved with herbicide

The trial was repeated on a Dermosol and a Sodosol, only 300m apart,



*Burr medic seedlings growing in the under-vine area of Chardonnay vines in the Coal Valley, Tasmania*

## Key Points

- Living mulches increased soil organic C, but only at one of two sites
- There were no consistent changes to water infiltration and storage
- Living mulch dry matter increased resilience of the soil structure on both sites, which lays the foundations for longer term changes to water infiltration and storage
- When it comes to influencing soil C and resilience, the quantity of living mulch dry matter is more important than the species

### Living mulch selection

The living mulches were chosen for their low growth habit (no mowing needed) and summer dormancy (lower water competition). It was challenging to prevent other species creeping in from the inter row. We measured the type and quantity of living mulch dry matter in each panel and compared it with the outcomes for soil C, resilience of soil structure and water infiltration and storage.



Assessing living mulch dry matter using a quadrat

### Total organic C increased on the Dermosol

Living mulch dry matter from the current and previous seasons, as well as the proportion of grass in the living mulch, all increased the total organic C in the soil on the Dermosol. Of these four factors, living mulch dry matter from the current season had the strongest effect (Figure 1).

On the Sodosol, the effect of living mulch biomass on total organic C was much smaller, probably because organic debris was leached more easily from this sandy soil.

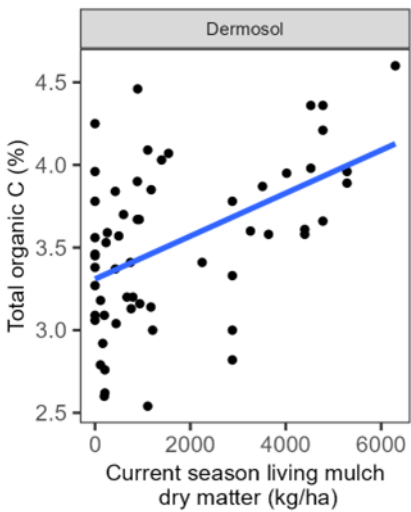


Figure 1. Higher quantities of current season living mulch dry matter were correlated with increasing total organic C on the Dermosol.

### Resilience of soil structure improved

Percentage of water stable aggregates was used as a measure of the resilience of soil structure to degradation. On both soils, more living mulch dry matter resulted in more water stable aggregates. On the Dermosol, the dry matter from the previous season had the strongest effect, whereas on the Sodosol the current and previous seasons dry matter had similar effects (Figure 2).

### Water infiltration and storage unchanged

Water infiltration and storage were not significantly affected in this three-year trial, most likely because the formation of pores is a slow process relying on the action of soil fauna and the growth and decay of plant roots. Nonetheless, the increase in water stable aggregates in the presence of living mulches will make pores less susceptible to degradation and enable them to accrue over time.

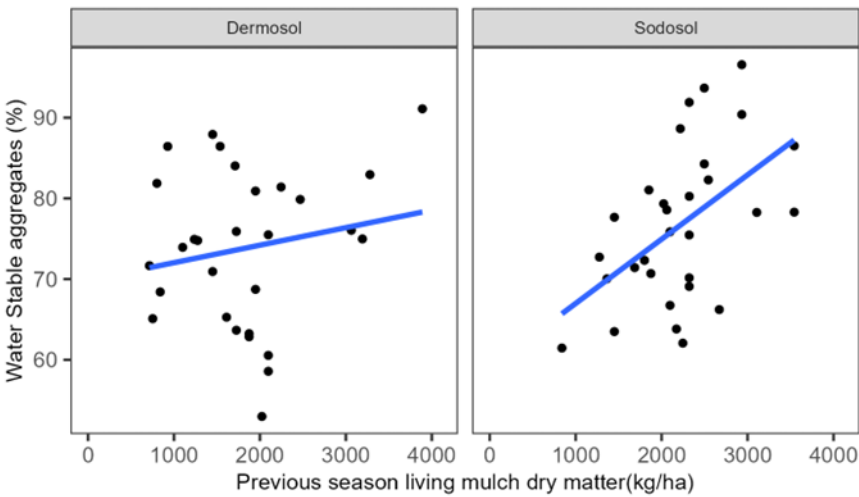


Figure 2. Higher quantities of living mulch dry matter in the previous season were correlated with increasing percentage of water stable aggregates on both soils.

### Take home messages

- To increase soil organic C and soil structural resilience in under vine soils, growers should prioritise the production of biomass over species composition.
- Living mulches are unlikely to improve water infiltration and storage in the short term, but they may improve the resilience of the existing soil structure.

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