

COMPOST IN VITICULTURE FACT SHEET

Using compost and mulch in vineyards

Compost and mulch are derived from organic materials through controlled decomposition harnessing biological processes to break down the organic matter into simpler substances. The organic matter is transformed into a valuable resource that can be used in many applications across agriculture, horticulture, landscaping and environmental management.

Compost is often applied to vineyards, alongside mulch on the surface, to improve vine growth, fruit quality, and conserve water.

Compost is generally used to improve soil productivity in vineyards with low soil organic matter. Compost can benefit the soil by increasing organic matter and microbial activity, which is crucial to soil health, and therefore improve the health of the vine in the long-term. In some situations, compost is applied to enhance soil structure and water-holding capacity, allowing for better root growth so the vine can access more nutrients and improve drainage.

Compost and mulch are often applied in vineyards to conserve water by increasing soil moisture retention and reducing evaporation and soil temperature.

Improving soil health can reduce a vineyard's reliance on synthetic fertilisers and herbicides to improve long-term sustainability and reduce input costs. Some vineyards are choosing to replace the use of synthetic fertilisers with more natural or organically certified products.



Types of Compost and Mulch used in Vineyards

Mature composts

The maturity and stability of composted products impact the performance of the compost once it is incorporated into the soil. Mature compost exhibits lower levels of phytotoxicity and is more stable, with a low nitrogen drawdown index (NDI). This means low nitrogen immobilisation potential, ensuring minimal nitrogen competition with plants.

Mature compost provides organic matter to improve physical soil characteristics as well as a good source of bacteria and micro-flora to stimulate invertebrate activity, which can improve plant uptake of nutrients.

Mulch

Mulch is regularly used in vineyards. It contains larger woody particles that have been through the composting process and can be screened into both fine and coarse mulches. These can originate from raw mulches that are composted, or oversized woody material produced from the composting process. In vineyards, composted mulch should be sized to 25-40mm and include a small percentage of compost fines for full effect.

Mulch for use in vineyards should be able to withstand windy conditions, and the particle size should provide aeration and surface protection to conserve water.

Grape marc

Grape marc consists of the solids from grape skins after pressing and can be used as compost. Composted grape marc contains high amounts of potassium in the range of 2-3% weight by weight due to potassium accumulation in the skins.

When making compost from grape marc, the pH must be neutralised and the carbon-to-nitrogen ratio optimised with partial breakdown. It is important to note that high potassium levels in the soil increase the risk of magnesium deficiency due to competing cations. Excessive potassium fertilisation can also be detrimental to wine quality as it has the potential to increase potassium concentration and pH of the grape must.

High pH decreases colour stability in red wines and makes the wine more susceptible to microbial and oxidative spoilage. Mixing grape marc with compost or pasteurised greenwaste can reduce the risk of high potassium levels.

Pelletised compost

Pelletised compost can be customised based on the nutrient content of the pellets. A pelletised compost provides an alternative option for compost application as each pellet is a consistent size with consistent chemistry. Pelletised composts are not often used in vineyards.



Key Considerations Before Applying Compost and Mulch in Vineyards

Compost and mulch applications should align with soil preparation activities.

It is essential that a **mature compost product** is applied to prevent food safety risks in the harvested crop and ensure a low nitrogen drawdown index (NDI), therefore allowing nitrogen to be more readily available for plant uptake.

AS4454: Composts, soil conditioners and mulches

The Australian Standard AS4454 Composts, soil conditioners and mulches provides a framework for defining and classifying compost, soil conditioners and mulches based on their composition, processing and intended use. While voluntary, it is referenced in most regulatory composting guidelines to establish minimum requirements for production, characterisation and quality testing.

Compost and mulch specifications

It is highly recommended to use products that meet AS4454 requirements. AS4454 classified compost, soil conditioners and mulches based on their composition, processing and intended use. It sets the minimum requirements for the quality and safety of products.

The general product characteristics for composts used for horticultural applications as set out by AS4454 are capture in the table below.

Characteristic	Unit	Target/typical range	Advice
pH	pH units	Range 5.5-8.0	If >8.0 determine total CaCO3 content
Electrical Conductivity (EC)	dS/m	<6	High EC may limit application rates
Organic Carbon	% dry matter	15-25	Generally higher organic carbon is preferable for compost of equivalent maturity
Carbon:Nitrogen Ratio	C:N	Typically 10:1-25:1 The recommended C:N ratio for good microbial metabolism to retain desirable amounts of carbon and nitrogen as feedstock for microbes is 20:1 (C:N).	C:N is typically higher for mulches used in orchards, lower for composts incorporated into soil in vegetable production

Other Considerations

Soil testing

It is important to conduct soil tests to tailor nutrient inputs to the specific needs of the vineyard and develop a monitoring program for soil and vines to improve vine health.

The following tests should be conducted:

- A soil nutrient test to check for baseline nutrient levels (key nutrients in vineyards include phosphorus, potassium, nitrogen, magnesium and calcium).
- It is important to test soil pH and use compost and lime to adjust levels if the pH is lower than the optimal range of 6.5–7.2 for nutrient uptake.
- The carbon to nitrogen (C:N) ratio should be considered.
- Electrical conductivity (EC) is required as a general indicator of soil storage capacity for available positively charged plant nutrients, including calcium, magnesium, potassium and sodium.
- Heavy metal content: AS4454 sets limits for heavy metals which may be present in compost and mulch, and includes contaminants such as arsenic, cadmium, copper, lead, mercury, nickel and zinc.

Applying compost and mulch in vineyards

A variety of spreaders are available on the market to assist in the application of compost and mulch in vineyards. Application rates are generally recommended at a concentration of 20-25% mixed with the soil when establishing a new vineyard.

The total amount of compost or mulch needed will depend on the soil constraints and farm budget. Compost will break down on the surface quickly, while mulch tends to break down at a slower rate, improving soil coverage for longer. If compost is required due to a soil constraint, more product should be applied in the first instance. If a soil constraint is not evident, smaller quantities can be applied.

Benefits of compost and mulch In vineyards

Compost or mulch can improve the soil's physical, biological and chemical properties and, as a result, improve the productivity and quality of the vineyard.

Key benefits include:

- Improved organic matter and organic carbon, boosting soil health and vine health
- Water savings due to improved soil water-holding capacity and infiltration and reduced soil temperature
- More efficient nutrient utilisation with a high carbon-to-nitrogen ratio
- Slow-release source of nitrogen, extending nitrogen availability and reducing leaching
- Contains a medium level of phosphorus, potassium, magnesium and calcium
- Weed suppressant in some cases, leading to reduced herbicide use.



Case study: Under-vine management with compost and Mulch in SA

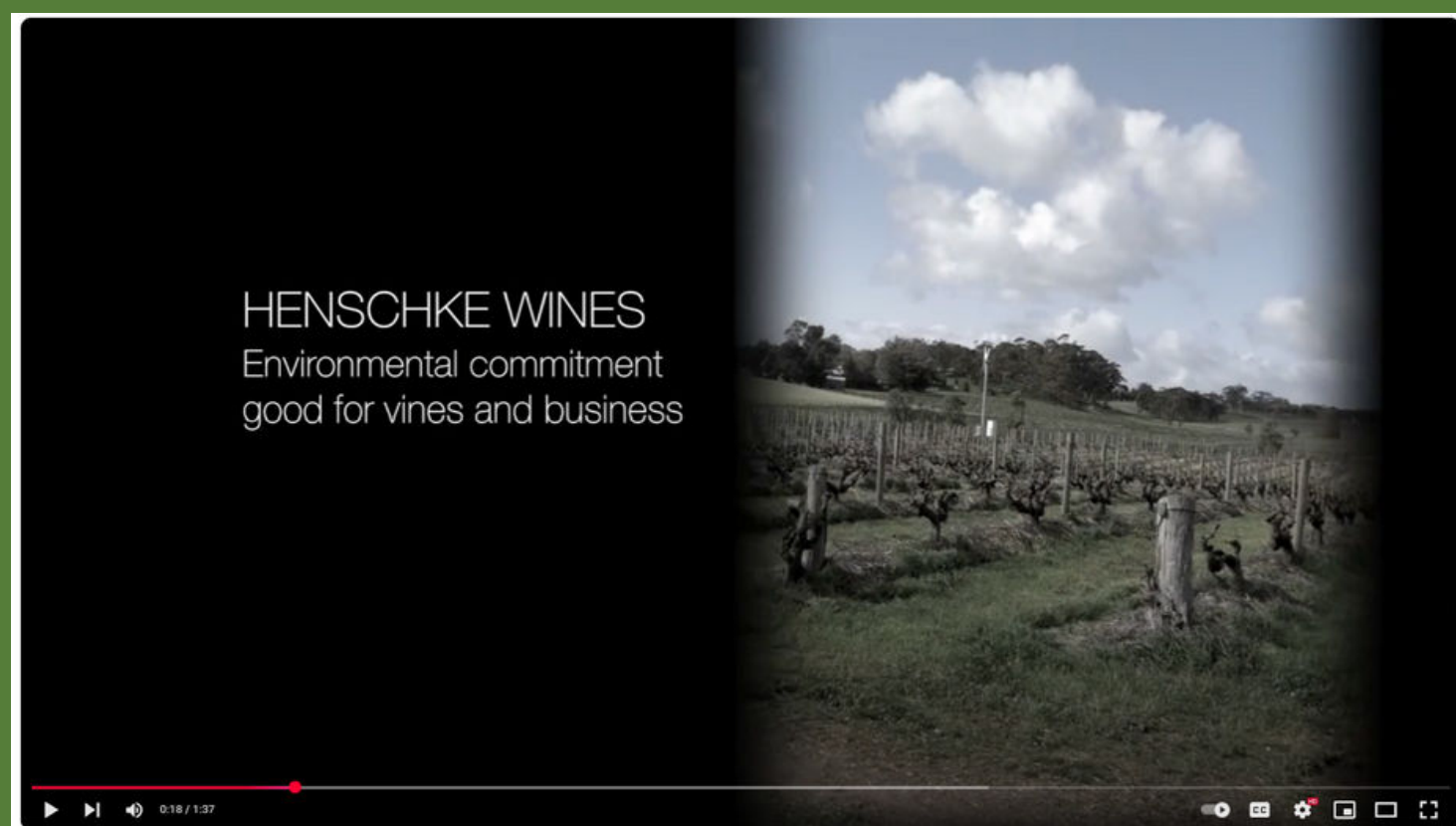
Henschke Cellars manages around 120 hectares of vineyards in the Eden Valley and Adelaide Hills in South Australia.

Since the 1990s, the team has experimented with mulches, composts, grasses and associated machinery to drought-proof the vineyards, protect the soil and build organic matter using a waste stream from the vineyards.

Henschke uses triticale straw mulch spread at a rate of 50 bales/ha every three years under-vine to eliminate the need for herbicides. This is complemented with an organic compost under the straw, made from vintage waste and supplemented with green waste compost from Adelaide. The compost was spread at a rate of 100 m³/ha.

The old dry grown vineyards are now more resilient in extreme weather conditions with crop levels and fruit maturity more balanced due to the reduction of early stress on the vines. Soil health and structure have improved with an increase in organic matter from 1% to 3%, and herbicides are no longer necessary. With no cultivation, the soil surface remains protected.

Source: Green Industries SA



Further information

- Best practice management guides (Eco Vineyards): <https://ecovineyards.com.au>
- Using composted grape marc in the vineyard (Australian Wine Research Institute):

<https://www.awri.com.au/wp-content/uploads/2018/10/s2035.pdf>

- The importance of soil organic matter (Australian Wine Research Institute): <https://www.awri.com.au/wp-content/uploads/2021/01/s2187.pdf>

Vineyard management practices to improve soil health (Australian Wine Research Institute):

<https://www.awri.com.au/wp-content/uploads/2018/06/vineyard-management-practices-to-improve-soil-health.pdf>

The Diverse Impact of Compost on Soil

Compost can address different soil characteristics and issues in viticulture production as described below:

POOR INFILTRATION

Improves soil structure which increases soil porosity, allowing water to penetrate deep into the soil profile.

SHALLOW SOILS

Applying a compost or mulch layer can reduce soil temperature in the top layers of the soil, which are exposed to temperature and moisture fluctuations

EROSION-PRONE SOILS

Applying a compost or mulch layer helps to reduce water runoff, remove sediment and filter contaminants.

HARD SOILS

Heavy machinery can create wheel tracks in the vineyard, which reduces tree root growth and makes it difficult for roots to penetrate the soil and extract water and nutrients. Compost provides organic matter as a food source for soil microbes, which then create soil crumbs and pores – this decreases soil hardness and increases the permeability of the soil.

SODIC SOILS

The high pH and hard-setting nature of sodic soils is usually ameliorated with gypsum to increase the amount of exchangeable calcium. Using compost and mulch in combination with gypsum helps the movement of gypsum through the soil by increasing soil porosity, allowing for more water infiltration and earthworm activity. Mature compost can have a liming effect without the need for additives.

SALINE SOILS

Soil salinity occurs with the use of saline irrigation water or through lack of water infiltration, which would normally leach salts out of the soil. Composted mulch conserves soil moisture and reduces the need for irrigation. Reducing evaporation will also prevent salts from accumulating on the soil surface and increase soil structure and water infiltration, helping flush salts through the soil profile.

CALCAREOUS SOIL, CAUSING LIME- INDUCED CHLOROSIS

Similar to the role of iron-chelating fertilisers, compost and mulch can reduce the incidence of lime-induced chlorosis as soil microbial activity helps to make nutrients more available to the plant, increasing cation exchange capacity and reducing the precipitation of iron.

