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The use of mulch and compost in vineyards

Mulch and compost — what is the difference?

There is some confusion about the terms 'mulch' and 'compost' which are often used interchangeably even though they are quite different products with different uses and potential benefits.

Mulch can be defined as material, organic or inorganic, that is used for placement on the soil surface as a protective cover. In vineyards, mulch is generally applied beneath the vines and includes materials such as cereal straw, wood chippings, cover crop slashings and plastic film. Organic materials are generally coarse in nature and commercially supplied products such as wood chippings may have been pasteurised to eliminate pathogenic organisms and

weed seeds. The use of mulch offers a number of potential benefits including improved soil moisture retention, weed suppression and reduced topsoil temperature variation and erosion. Mulch is also likely to enhance the population of soil saprophytic fungi as they are the primary organisms responsible for the breakdown of high lignin material. Nutrients are imparted to the soil, albeit very gradually, as this material is broken down.

Compost is a generic term used for a product generated from the composting process. It can be defined as organic material that has undergone controlled biological and chemical decomposition (including pasteurisation), resulting in a stable substance that is resistant to further decay. In vineyards, compost is applied either to the topsoil or incorporated into the subsoil as a conditioner, depending on the objectives of the vineyard.

The majority of composts contain nutrients and satisfactory numbers of bacteria which help to improve soil nutrient levels and biological health and result in positive vine growth responses. Well-managed 'quality' composts have undergone a degree of humification and therefore have the added benefit of imparting colloidal material (humus) and a large diversity of organisms, including protozoa and nematodes, to the soil. These additions to the soil help reduce the risk of pathogen growth and may also increase vine resistance to diseases.

In summary, *you can use compost as mulch but you cannot use mulch as compost*. This distinction might seem trivial, but it is important to understand in order to make an informed decision on the suitability of a particular product for a particular task.



Compost application at Margaret River trial site.



What are the potential benefits of using mulch and compost?

Many Australian soils have a poor natural fertility and low organic matter levels and can become easily degraded through intensive agricultural practices. When a soil becomes degraded, fertiliser, water and amendment (e.g. lime and gypsum) inputs generally increase which is a further cost to both the grower and the environment. The surface application of mulch and/or compost is being increasingly used in vineyards since they are proving to be viable economic options with a range of potential benefits. The potential benefits, including the reason for each benefit, are shown in Table 1.

Which product should I choose and how should it be applied?

It is important to identify why you want to apply mulch and/or compost since the potential benefits shown in Table 1 are only achievable if the correct product is used at the correct rate of application. Since the choice of product will depend on the specific needs of the vineyard, the following factors should be considered:

Particle size

Where the primary objective is to conserve soil moisture, suppress weed growth, reduce topsoil temperature

fluctuations and/or minimise erosion, coarse-textured mulches are recommended (Figures 1 and 2). The coarseness in texture allows water and air to reach the soil easily.

Where the primary aim is to improve soil health (i.e. physical, chemical and biological properties) and fertility, composts are recommended (Figure 3). These generally have a finer texture than mulches and as a result, water can be prevented from reaching the soil if the material is applied too thick.

Application rate and frequency

For coarse-textured mulches, aim to achieve a depth of about 50–75 mm (no greater than 100 mm) and a band width of at least 500 mm (Figure 2).



Figure 1: Cereal straw banded undervine (a) and cover crop slashings side-thrown undervine (b) can be used as mulch.

Table 1. The potential benefits, including the reason for each benefit, of using mulch and compost in the vineyard.

Potential benefits of mulch	Reason for benefit
Improved soil water retention and water use efficiency / less irrigation requirements	Reduces solar radiation and wind speed at the soil surface, thereby reducing water loss through evaporation. Additional increases in organic matter through decomposition, improves soil structure and hence, soil water storage, aeration and drainage.
Reduced weed growth / less herbicide requirements	Suppresses the emergence and growth of weeds. Weed suppression increases as the thickness of the layer increases.
Reduced fluctuation in topsoil temperature / less heat damage and vine stress	Buffers changes in topsoil temperature and radiation, thereby promoting a more even temperature regime for root survival and fruit ripening. Darker products generally heat up more than lighter products.
Reduced soil and nutrient loss / less vineyard inputs	Protects topsoil from the direct impact of rain and wind, thereby reducing erosion and land degradation.
Potential benefits of compost	Reason for benefit
Improved soil health and vine performance / less vineyard inputs	Under suitable environmental conditions, increases topsoil organic matter and humus levels with subsequent improvements in soil physical, chemical and biological properties. Benefits include improved soil aggregation and structure, water infiltration and aeration, water and nutrient holding capacity and soil organism population, diversity and activity. Micro-organism activity in the rhizosphere (area immediately surrounding roots) is particularly beneficial.
Improved soil fertility / less fertiliser requirements	Contains nutrients (particularly N, P, K) present in both inorganic and organic forms. Inorganic nutrients become available immediately, while organic nutrients are released slowly over time as material undergoes further microbial decomposition. The decomposition rate of organic matter and subsequent release of nutrients is determined by climate, soil types and management practices.
Reduced pests and diseases issues / less chemical inputs and reduced risk of crop loss	Increases the population, diversity and activity of beneficial soil organisms which reduces the risk of pathogen growth and may also increase vine resistance to diseases.



Figure 2: Wood chippings banded undervine are becoming popular as mulch.

For finer-textured composts, aim to achieve a depth of about 25 mm (no greater than 50 mm) and a band width of at least 500 mm (Figure 3).

When using compost as a sub-soil conditioner, the nutrient content of the product in relation to vine requirements should be used to determine application rates.

Depending on the type of product used, soil type, environment and management practices, a 3 to 5 year benefit can be realised before a further application is required.

Composition

- Soil moisture: Composts generally have a moisture content of between 30–40% on a wet weight basis.
- Carbon to Nitrogen ratio (C:N): This should be below 20:1 for mulch to ensure that there is no nitrogen drawdown (i.e. there is no microbial demand for nitrogen at the expense of the vine). This should not be an issue for compost since values are usually around 10:1.
- Nutritional content: Since wine grapes do not require high rates of nutrient inputs, it is important to know the mineral content of the compost being added to the vineyard.



Figure 3: Composted materials are generally finer in texture than mulch and are applied at shallower depths to ensure water infiltration is not impeded.

What are the costs?

If purchasing from a supplier, costs will vary depending on the type of product(s) required, application rate(s), cartage distance to the site and spreading. If making your own product(s), costs will vary depending on costs associated with collecting ingredients and transportation to the site, production (e.g. turning, irrigating and monitoring), transport to the vineyard and spreading.

What factors should be considered and assessed when using mulch and compost?

- The needs of a vineyard should be assessed on an individual block basis depending on soil health, vine growth and crop productivity, and fruit and wine quality specifications.
- The use of mulch and/or compost banded undervine in combination with mid row cover crops is a highly beneficial synergy for improving soil health, organic matter and nutrient levels.
- When using certain mulches, there may be elevated vineyard risks associated with frost, fire and pests.
- Mulch should not come in direct contact with vine trunks as this can result in stem rot.
- Monitor soil moisture content, particularly when using mulch, to manage irrigation scheduling requirements.
- Monitor vine nutrient status and check for deficiency symptoms associated with 'nitrogen drawdown' when using mulch since the C:N ratio may be high.
- Compost can influence vegetative growth and fruit composition through the addition and improved soil availability of nutrients. Monitor vine performance (crop yield, fruit and wine quality) to evaluate the benefits or otherwise of the applied product.
- Consider monitoring changes in soil health attributes (especially those associated with biology) when using compost.

How is a composted product manufactured?


The Australian Standard 4454-2012 provides a framework for the production of composts and quality assurance. However, composted materials also need to be 'fit for purpose' and may have specifications that go beyond the requirements of this standard. Many different organic materials can be safely composted and often include garden, wood and paper waste, manure and grape marc. The raw materials are generally pre-processed and then mixed to a balanced and consistent 'recipe' which ensures optimal conditions for biodegradation. Micro-organisms breakdown organic

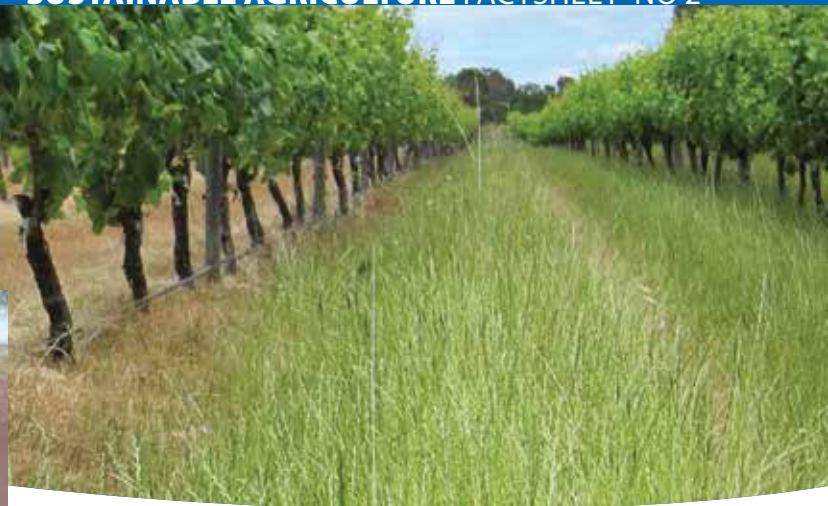


Specialised equipment is generally used to irrigate and turn composting material to ensure that it is well-aerated and meets the required internal temperature and moisture content.

materials by using the available food (mainly carbon and nitrogen), water and oxygen in order to grow and multiply. During this process a starting C:N ratio of about 30:1 will be reduced to about 10:1 as carbon is converted to carbon dioxide. The process generates heat, with a 'peak heat' temperature of between 55–70°C required to kill pathogenic organisms and sterilise weed seeds. Well-managed 'quality' compost will have documented additions of water and staged turnings to ensure that ideal soil moisture and oxygen/carbon dioxide levels are maintained throughout the process. The entire process takes between 8 and 24 weeks depending on the nature of the raw materials and the ambient temperature. After this time period, the composted material is left to 'stabilise and mature' whereby it cools down and the rate of breakdown decreases.

Checklist for choosing a supplier

- Do they understand my needs?
- Do they have the products that suit my purposes and if not, are they prepared to manufacture products for me?
- Do their products meet the Australian Standard for Composts, Soil Conditioners and Mulches (4454-2012)?
- Can they provide documentation of a quality control system in place?
- Do they have specification sheets, including recent analyses of moisture and nutrient content, carbon to nitrogen ratio and nitrogen drawdown index?
- Are their products free from contaminants (e.g. stones, plastic, glass) and bad odours?
- Are their composted products stable and mature (i.e. not too hot for application)?
- Can they offer a consistent and regular supply?
- Do I feel comfortable using this supplier? 



Useful references:

Compost for Soils website: www.compostforsoils.com.au

Soil Foodweb Institute website: www.soilfoodweb.com.au

The Recycled Organics Unit has developed a nutrient calculator for composts to help growers calculate the nutrient contribution of composted products. www.recycledorganics.com

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