australian organics recycling association

COMPOST IN ORCHARDS FACT SHEET

Using compost in fruit and nut orchards

Compost is a nutrient rich, soil like product 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.

The application of compost will help to set the orchard up for success. Applying compost at the planting stage can protect young trees from heat and moisture stress, as compost applied to the top layer of soil helps to insulate the roots from temperature extremes and retain soil moisture levels.

Compost provides soil organic matter as a feedstock to soil microbes which are vital to soil health. This in turn increases organic carbon levels in the soil, improving soil structure, water infiltration and nutrient retention with an improved cation exchange capacity. These improvements can lead to increased yield, water conservation and better pest management.

Types of Organic Amendments used as Compost

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.

Composted coarse mulch

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 orchards, composted mulch should be able to withstand windy conditions and the particle size should provide aeration and surface protection to conserve water.

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.

Managing nutrition in perennial tree crops

Essential nutrients for fruit trees include nitrogen, phosphorus, potassium, calcium, magnesium and sulphur as well as micronutrients including boron, zinc, iron, copper and molybdenum.

It is important to balance all nutrients, which in perennial tree crops, exist in plant organs in different concentrations at different times of the year. Perennial trees partition a substantial portion of some nutrients back into the tree before senescence with very little of some nutrients lost from the leaves and prunings. Nutrients are redistributed from older organs to areas of active growth.

It is important to conduct leaf chemical analysis to identify any nutrient deficiency or toxicity. Availability of nutrients is closely related to the mineral content in the soil as all nutrients are taken up through the roots. Composts can enrich the soil as it acts as a feedstock for soil microbes which can mineralise nutrients to make them available to the plant.

Compost 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 captured in the table below.

Characteristic	Unit	Target/typical range	Advice
pH	pH units	Range 5.5-8.0	If >8.0 determine total $CaCO_3$ 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

Food safety requirements

Adhering to the Freshcare Food Safety and Quality Edition 4.2 (FSQ4.2) standard is important to avoid risks to human health following the application of compost in a vegetable crop.[PT1] Freshcare restricts the use of unpasteurised products including manures regarding timing of application prior to harvest. To satisfy Freshcare provisions, verified evidence of pasteurisation needs to be provided by the compost manufacturer. For more information, refer to “A guide for use of recycled organics in horticulture” https://www.freshcare.com.au/wp-content/uploads/2023/05/Compost-Factsheet-Growers.pdf

Other considerations

Impacts of compost on replant disease

Replant disease of orchards is a critical issue that has a major impact on productivity and profitability in the horticulture industry. It can affect most fruit crops with its exact cause remaining unknown. However, symptoms are caused by a complex mix of diseases, bacteria, and fungi that reduces tree growth. Treatment options for replant disease are limited. Methyl bromide can no longer be used to treat replant disease and other fumigants including chemical fumigants and biofumigants have been shown to be in-effective..A trial in Tasmania found that the application of compost had a positive and beneficial impact on apple replant disease due to its nutrient addition on the growth of the orchard, rather than inhibition of the disease (Hort Innovation, 2005).

Benefits of compost and mulch in orchards

Compost or mulch can improve the soil's physical, biological and chemical properties and, as a result, improve the productivity and quality of the orchard. Key benefits include:

- Improved organic matter and organic carbon, boosting soil health and tree 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.

The Diverse impact of compost on soil

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

- **Poor infiltration** – improves soil structure which increases soil porosity, allowing water to penetrate deep into the soil profile.
- **Hard soils** – heavy machinery can create wheel tracks in the orchard, 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.
- S**hallow 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.
- **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.
- **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.

Applying compost in orchards

Compost can be mixed in with soil when establishing a new orchard. It can be applied either as a band along the planting row and then cultivated into the rip line in the top 10-25cm of the soil. The quantity of compost required will depend on the row spacing and soil deficiencies.

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 the soil constraint is not evident, smaller quantities can be applied.

Applying a small amount of compost more regularly is recommended as it keeps the soil biology progressing over time.

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