

Information Sheet No. 3-8

Producing Quality Compost

Introduction to Australian Standard AS 4454 (2003) composts, soil conditioners and mulches

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What is the Australian Standard AS 4454?

The Australian Standard AS 4454 contains guidelines to provide manufacturers, local government bodies, consumers and growers with:

- minimum requirements for the physical, chemical and biological properties of composts, soil conditioners and mulches; and
- labelling and marking requirements, in order to facilitate beneficial recycling and use of organic materials with minimal adverse impact on the environment and public health.

The standard also sets out best practices to assist processors to consistently produce quality *composts, soil conditioners, mulches* and *vermicasts* (Plate 1).

Why is a product standard needed, and benefits of compliance?

There are composted products in the market place that do not live up to consumer's expectations. Some tend to be variable in quality, and others can damage plants when applied as a soil conditioner or a mulch.

One way a manufacturer can assure the quality of a product is to have it tested and/or certified to the criteria specified in AS 4454. Formal product certification to the Australian standard allows the manufacturer of a compost, soil conditioner or mulch to label their product with the widely recognised Australian standard 'five ticks' logo.

Australian standard certification 'ticks' allows the differentiation of products in the market place. Consumers can buy a certified product with confidence, with the assurance that the product meets quality standards and is safe to use.

Plate 1. A composted soil conditioner certified under AS 4454 (2003) for composts, soil conditioners and mulches. This product is suitable for incorporating into soil to improve soil conditions and plant growth.



The best chance of producing a compost, soil conditioner or mulch that consistently conforms to the Australian Standard is to control the manufacture with documented management system, such as an ISO 9001 *quality management system*.

Best practice principles can be used to develop and implement procedures to maintain required product quality, and to minimise the impact of operations on the environment.

The success of a composting operation is dependent on: systematic operational practices, quality control, and meeting customer requirements (Recycled Organics Unit, 2002). AS 4454 can contribute to achieving these goals.

What products are covered in AS 4454?

The standard provides quality guidelines for two major categories of products:

- **Pasteurised products** have been processed to achieve effectively pasteurised yet are still immature and relatively unstable.
- **Composted products** have been processed more thoroughly to achieve pasteurisation & maturity.

Products defined in the standard are manufactured by controlled aerobic and thermophilic biological transformation to achieve pasteurisation and a specified level of maturity.

Before organic materials are used as soil conditioners or mulches, they should be *pasteurised* to kill any harmful bacteria or plant pathogens. The pasteurisation process — achieved through keeping materials at a minimum of 55°C for at least three consecutive days — will also destroy or reduce the viability of many weed seeds.

Pasteurisation of materials can be achieved over a short period of

processing, and pasteurised products can therefore still be unstable. Whilst commonly considered as lower grade products, they do not have the risk of distributing plant disease organisms or weed seeds which can be spread via unprocessed products such as leaf mulch or manure.

Composted products are processed for significantly longer periods under aerobic (high oxygen) and thermophilic (>55°C) conditions until the compost is stable and mature. This involves regular turning of compost piles or blowing air into the composting mass.

As with pasteurised products, composted products are free of plant pathogens, bacteria harmful to humans or animals, and plant propagules (weeds). In addition, mature *composts* can be applied at greater rates and without risk of damage to plants as the mature product does not continue to break down rapidly, does not have potential for negative impact on plant growth, and provides nutrients to plants.

The (solid) product of vermiculture operations – vermicast – is also now included in the AS 4454. This product can be produced from compostable organic materials that have achieved pasteurisation through composting or some other process.

Where a dedicated pasteurisation process has not been used in the manufacturing of vermicast, a plant propagule test is required to demonstrate that the product does not contain viable plant propagules.

Within this standard, vermicast may be classified as a pasteurised vermicast or pasteurised soil conditioner, and requires 90% of particles to pass through a 1.18 mm sieve. However, solid vermicast products can also be tested and certified as composted mulch or composted soil conditioner provided they meet the specified requirements.

Definitions

Compost

An organic product that has undergone controlled aerobic and thermophilic biological transformation to achieve pasteurisation and a specified level of maturity.

Soil Conditioner

Any composted or pasteurised organic material that is suitable for adding to soils. This term also includes ‘soil amendment’, ‘soil additive’, ‘soil improver’ and similar terms, but excludes polymers which do not biodegrade, such as plastics, rubber and coatings. Soil conditioners may be either ‘composted soil conditioners’ or ‘pasteurised soil conditioners’. Soil conditioner has not more than 15% by mass of particles with a maximum size above 15 mm.

Vermicast

Solid organic material resulting from the biological transformation of compostable organic materials in a controlled vermiculture process.

Mulch

Any pasteurised organic product (excluding polymers which do not degrade such as plastics, rubber and coatings) that is suitable for placing on soil surfaces. Mulch has at least 70% by mass of its particles with a maximum size of greater than 15 mm.

Quality Management System

An integrated policy and set of procedures an organisation establishes to systematically ensure its products consistently achieve consumer satisfaction.

Pasteurised Product

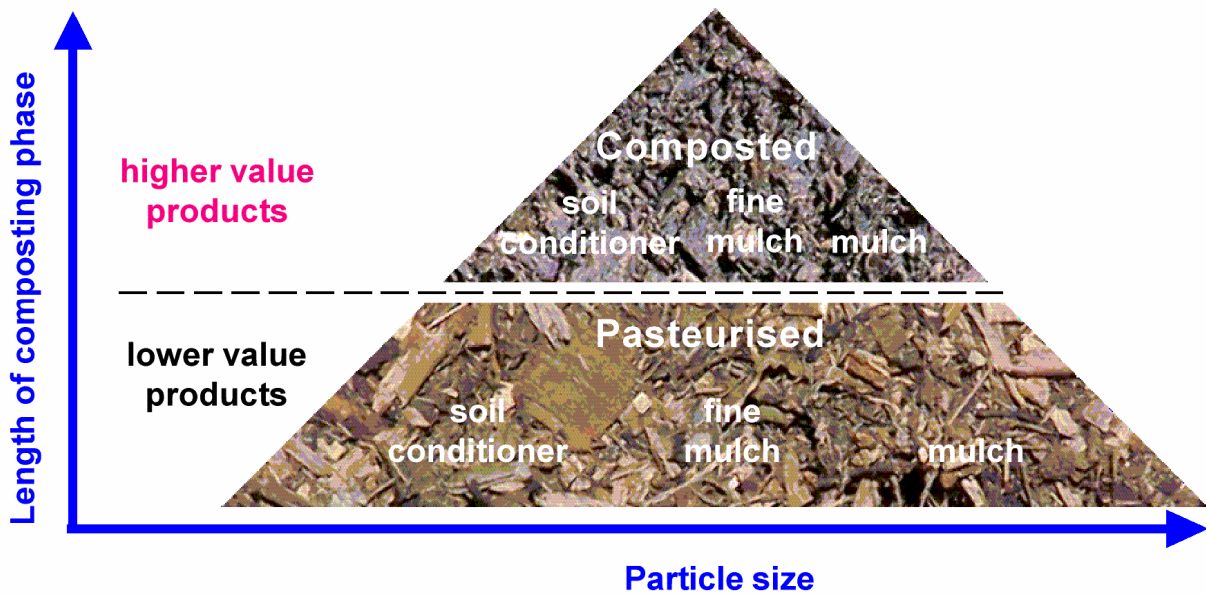
Organic material resulting from the controlled microbiological transformation of organic materials under aerobic and thermophilic conditions such that the whole mass of constantly moist material is subjected to a least 3 consecutive days at a minimum temperature of 55°C.

Pasteurisation

The process whereby organic materials are treated to kill plant and animal pathogens and weed propagules.

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Figure 1. The six products covered in the Australian Standard for composts, soil conditioners and mulches (Standards Australia AS 4454, 2003). These products are divided into two main categories: composted products and pasteurised products. Composted products command a high price in the market than pasteurised products as they are more fully decomposed, less likely to bind or immobilise nutrients when applied or incorporated into soil, and better able to support plant growth.



Soil conditioners, fine mulch and mulches

Pasteurised products and composted products are further divided in this standard into soil conditioners (for incorporation into soil), fine mulches and mulches (both for surface application). This division is based mainly on particle size.

Seven products are defined and specified in this standard, including:

- composted soil conditioner
- composted fine mulch
- composted mulch
- pasteurised soil conditioner
- pasteurised fine mulch
- pasteurised mulch
- pasteurised vermicast.

These AS 4454 product categories are shown also in Figure 1 above.

In the 2003 edition of this standard, the particle size specification for soil conditioners and fine mulches has

been revised. A 16mm sieve is used to assess compliance.

Soil conditioners are required to have less than 20% (by mass) of their particles greater than 16 mm (ie. > 80% must pass through the 16mm sieve).

Fine mulches are required to have more than 20%, but less than 70% (by mass) of their particles with a diameter greater than 16 mm (ie < 70% retained by the 16mm sieve).

Mulches are 'coarse products', as they are made up of equal to or more than 70% (by mass) of particles with a size greater than 16 mm (ie > 70% retained by the 16mm sieve).

Mulches are only for surface application on top of soils.

What products are excluded from AS 4454?

Shredded garden organics (sometimes referred to as raw mulch, leaf mulch or chipped garden waste) are excluded from the standard, unless they have been subjected to a pasteurisation or composting process.

This is because these raw materials have a high probability of containing plant propagules and pathogens.

Also excluded are home composting products for self use, organic fertilizers, liquid organic wastes, liquid seaweed products, non-organic mulches (eg gravel), non-organic soils and soil conditioners (eg. sand or gypsum), non-compostable organic materials (eg. plastics), materials variously described as 'compost starters' and 'activators', and vermicast that has not been subjected to pasteurisation or composting (or an equivalent process).

AS 4454 is not specifically concerned with the source of compostable organic materials from which products are manufactured, it focuses on physical, chemical and biological specifications for the defined categories of products.

Overview of product quality guidelines

The standard specifies minimum quality requirements for the seven defined products.

Tests are specified for a range of quality parameters to assess different physical and chemical characteristics of the product.

The extent of testing required to demonstrate conformance depends on the type of product. The number of tests that are required for assessing soil conditioners and fine mulches is greater than the number required for (coarser) mulches.

The performance requirements for soil conditioners are more stringent than the equivalent performance requirement for mulches in a number of characteristics that are tested (eg. moisture content; sodium; plant toxicity).

The performance requirements for composted products are higher than the equivalent performance requirements for pasteurised products in a number of characteristics that are tested (eg. Ammonium-N; Nitrate-N; maturity – self heating).

A greater number of parameters are tested for soil conditioners because they tend to be mixed into soil where they can more directly affect soil nutrients and the availability of oxygen in the root zone of plants, and are more likely to affect soil and plants if not properly composted or inappropriately applied.

Although fine mulches are not mixed with soil, their small particle size does result in some mixing with surface soil over time.

The risk of such damage occurring through inappropriate application of coarse mulches is lower.

Overview of best practice guidelines for composting and vermiculture systems

AS 4454 also contains information on best practice for the operation and management of common composting systems (Appendix N).

The revised 2003 edition contains a best practice guideline for managing vermiculture systems (Appendix O). The inclusion of vermicast is the world-first formal standard for vermiculture products.

This standard provides basic guidelines for *Turned Piles*, *Aerated Static Piles*, *Windrows with or Without Aeration*, *In-vessel* and *vermiculture* systems.

The purpose of these best practice guidelines is to inform the consistent production of quality products. Key monitoring procedures are detailed to support effective process control and the consistent production.

Testing to meet requirements of AS 4454

Appendix P in this standard specifies the means of demonstrating compliance with AS 4454.

Certified products provide the highest level of quality assurance and confidence in product quality. Product certification also provides the greatest protection from potential legal liability for the processor.

Whilst manufacturers can claim that their products comply with the requirements of the standard without being certified by an accredited third party (such as SAI Global), such claims must be backed up with evidence required to prove these claims. Without such evidence, manufacturers are likely to be in breach of trade practices legislation and regulations, and therefore potentially liable for significant penalties.

The absence of a structured management system (such as an AS/NZS ISO 9001 compliant quality management system, which would also need to be evidenced), the only potentially valid option for demonstrating compliance is the testing of each batch of product for

Composting

The process whereby organic materials are pasteurised and microbially transformed under aerobic and thermophilic conditions for a period of not less than 6 weeks to achieve a specified level of maturity.

Turned Pile

System of composting involving the periodic turning of piles of organic matter with mechanical equipment (e.g. front-end loaders or specialised windrow turners) between 1.5 and 3 m in height. Turning assists in: aeration and oxygen re-supply; eliminating odours; reducing consolidation, and moisture and nutrient re-distribution.

Aerated Static Pile

Forced aeration method of composting in which a free standing pile is aerated by a blower moving air through perforated pipes located beneath the pile.

Windrow with or Without Aeration

System of composting involving the aeration of horizontally extended piles formed by a front-end loader or windrow turner. Extended piles are generally 1.5 to 3 m in height, and length is limited by the size of the composting pad. Aeration can be achieved by mechanical turning and/or the delivery of air from the base of the windrow (see aerated static pile).

In-vessel

A containerised unit in which vermiculture, compost or anaerobic digestion-based processes are performed. Containers vary in size, configuration, degree of automation and level of process control. In-vessel systems are often used for treatment of putrescible organics in populated areas as they have minimal or no significant impact on the environment (e.g. through the generation of odour, leachate or attraction of pests or vermin).

Vermiculture

System of stabilising organic materials under controlled conditions by specific worm species and microorganisms under mesophilic temperatures. Commercial vermiculture systems include: windrows or beds; stackable trays; batch-flow containers, and continuous flow containers.

