Information Sheet No. 7-6-1
Vermicast

Information Sheet No. 7-6-1
Third Edition 2007

Inside This Sheet

ISBN 1-876850-03-5

Definitions

Vermicast are produced from compostable organic materials, which are processed through *vermiculture* systems for use as soil conditioner.

Vermicast may be *pasteurised* or non-pasteurised. Due to their small particle size (<15 mm), vermicast are usually used as a soil conditioner.

Commercial vermiculture systems include: windrows or beds; stackable trays; batch-flow containers, and continuous flow containers.

Quality

Pasteurised vermicast is classified under Australian Standard AS 4454 (2002) as a soil conditioner. Non-pasteurised vermicast products can be classified as a product similar to (non-pasteurised) shredded garden organics.

Some manufacturers of vermicast maintain that their products are "biologically" pasteurised, that is, worms and other beneficial microorganisms in the vermiculture system eradicate harmful pathogens, weeds and seeds.

However, as many of these products are not tested to confirm the absence of weeds, seeds and plant/animal pathogens, there is no way of knowing whether or not pasteurisation has occurred.

Buyers of vermicast should therefore look for products that have been pasteurised according to the Australian Standard 4454 (2002), to ensure destruction of weeds, seeds and disease organisms that may be present in the original organic materials.

It has also been suggested that vermicast have disease suppression qualities. The extent to which these products provide such benefits, however, vary with different methods of production and *feedstock* types used (Kannangara *et al.*, 2000).

Pasteurisation of feedstock should occur in the initial *thermophilic* phase of an aerobic composting cycle. Products should then be cured to make a mature vermicast.

Should pasteurisation or sterilisation take place after this curing phase, then the beneficial microorganisms will be destroyed, and potential pathogen suppression benefits of the

Plate 1. Mature vermicast, which have been produced from food organics.

vermicast will not occur.

Uses

These products can be mixed into soils to improve soil condition and plant growth. Vermicast can be used in a variety of applications, including: home gardens; community open space; urban landscaping; agriculture; forestry, and for soil and site rehabilitation. These products can also be used as minor components in potting mixes.

Benefits

Pre-pasteurised or pre-composted vermicasts have the same benefits as pasteurised or composted soil conditioners when incorporated into soil. These include:

- Reduced soil erosion, particularly in areas with exposed soils,
- Increased water retention in the upper soil profile, thereby reducing the frequency of watering to maintain plant growth;
- Release of nutrients for plant growth, thus reducing the need for chemical fertilisers (Vasanthi and Kumaraswamy, 1999);
- Improved plant growth (Atiyeh *et al.*, 2000)
- Suppression of soil borne plant diseases (Kannangara *et al.* 2000), thereby reducing fungicide and/or bacteriocide requirements.

Non-pasteurised vermicast have similar benefits to their pasteurised equivalents, but may also carry many risks (see below).

Risks

If these products are not properly pasteurised according to Australian Standard AS4454 (2002), they can contribute to a number of problems including:

- Phytotoxicity;
- Nitrogen drawdown;
- Chemical or physical contamination;
- Odours;
- Weed propagation, and
- Transference of pathogens to plants and animals.

See Information Sheet 6-4, *"Buyer beware: quality issues for recycled organics products"* in the "*Buyers Guide for Recycled Organics Products*" for more information.

Pre-pasteurised or pre-composted vermicast carry minimal risks, if handled and used correctly. These products do not spread weeds and/or plant/animal pathogenic micro-organisms, as they or their feedstocks have been heat treated during a composting or equivalent process.

Fresh vermicast are not mature and continue to decompose following use. Thus, these products cannot be incorporated in excessive quantities into soils, as increased oxygen consumption from decomposition processes in the root zone can deleteriously affect plant growth.

When incorporated into soils, planting should be delayed for at least two weeks to allow the material to decompose further.

Mature vermicast, however, can be applied at greater rates and do not usually require a delay before planting.

Additives

Vermicast are generally nutrient rich and are not usually supplemented with additives. However, they may be inoculated with different microorganisms in some instances to enhance their disease suppressive characteristics.

Definitions*

Vermicast

Any organic material which has been subjected to worm activity under aerobic and *mesophilic* conditions. Vermicast manufactured from non-pasteurised feedstocks may contain weed seeds and pathogenic microorganisms, as the product is not subjected to a pasteurisation process.

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.

Pasteurisation

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

Composting

The process whereby organic materials are pasteurised and microbially transformed under aerobic and thermophilic conditions for a period not less than 6 weeks. By definition, it is a process that must be carried out under controlled conditions yielding mature products that do not contain any weed seeds or pathogens.

Feedstock

Organic materials used for composting or related biological treatment systems. Different feedstocks have different nutrient concentrations, moisture, structure and contamination levels (physical, chemical and biological).

* Recycled Organics Unit (2000).

Application rates

The rate of vermicast application depends on maturity.

For fresh (immature) vermicast, the rate of application to soil depends upon the length of time to planting. If seeds, seedlings or established plants are to be planted within a couple of days from the incorporation of the vermicast, rates should not exceed 20 L/m^2 (layer not exceeding 20 mm depth). If planting is to proceed at least two weeks after application, the application rate can be up 50 L/m^2 (layer no exceeding 50 mm depth). At greater application rates, oxygen availability to plants will be reduced and may impair plant growth or result in plant death.

For mature vermicast, the rate of application can be up to 150 L/m^2 (150 mm in depth). At greater rates, oxygen availability to plants will reduce and may impair plant growth. Planting can proceed directly after incorporation of mature vermicast.

Vermicast are also used as minor components in potting mixes, though the addition rate to potting mixes is not usually more than 20% (by volume), as this will reduce the level of air-filled porosity in the mix. Vermicasts in potting mixes help retain water and can supply plant nutrients and improve plant growth (Atiyeh *et al.*, 1999).

Application methods

Vermicast are usually incorporated into bare soil containing no plants. Seeds, seedlings, or established plants are usually planted after the vermicast product has been applied.

In small areas, such as domestic gardens, vermicast can be dug into soil with a garden fork or spade.

For larger areas, such as agricultural or forestry applications, vermicast can be spread with a manure spreader and tilled into the soil.

Vermicast can be used as components in potting mixes. Usage is therefore the same as for potting mixes.

Definitions*

Thermophilic

Temperatures above 45ºC. Used to describe a stage of composting in which high temperatures are sustained resulting in high rates of decomposition and pasteurisation of the organic material. Heat tolerant microorganisms survive well in these conditions.

Mesophilic

A temperature range of 20-45°C. Mesophilic microorganisms grow well at these temperatures and are also important for decomposition during the cool-down or maturation stage of composting. Most pathogenic microorganisms grow in this temperature range, and are thus destroyed under high temperature (thermophilic) conditions during composting.

* Recycled Organics Unit (2000).

Important references

- Atiyeh, R.M., Subler, S., Edwards and Metzger, J. (1999). Growth of tomato plants in horticultural potting media amended with vermicompost. *Pedobiologia*. **44**, 579-590.
- Atiyeh, R.M., Subler, S., Edwards, C.A., Bachman, G., Metzger, J.D. and Shuster, W. (2000). Effects of vermicomposts and composts on plant growth in horticulutral container media and soil. *Pedobiologia*. **44**, 579-590.
- Kannangara, T., Utkhede, R.S., Paul, J.W. and Punja, Z.K. (2000). Effects of mesophilic and thermophilic composts on suppression of fusarium root and stem rot of greenhouse cucumber. *Canadian Journal of Microbiology*. **46**, 1021-1028.
- Recycled Organics Unit (2000). Recycled Organics Industry Dictionary & Thesaurus: standard terminology for the NSW recycled organics industry. Recycled Organics Unit, internet publication: http://www.rolibrary.com
- Standards Australia (2002) AS 4454 – Composts, soil conditioners and mulches. Standards Association of Australia; Homebush, NSW, Australia.
- Vasanthi, D. and Kumaraswamy, K. (1999). Efficacy of vermicompost to improve soil fertility and rice yield. *Journal of the Indian Society of Soil Science*. **47**, 268-272.

Acknowledgements

The development of this information package has been funded by Resource NSW.

Produced by:

Recycled Organics Unit
PO Box 6267
The University of New South Wales
Sydney Australia 1466

Online contact details:

ROU	Angus Campbell
Internet	www.recycledorganics.com