

Information Sheet No. 5-8

Composting Science for Industry

pH

Information Sheet No. 5-8
3rd Edn. January 2007

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Role of pH in composting

The composting process is relatively insensitive to *pH*, within the range commonly found in mixtures of organic materials, largely because of the broad spectrum of microorganisms involved (Rynk *et al.*, 1992).

Although opinions vary, the optimum range for composting is somewhere in the range of 5.5 to 9.

It is important to note that composting is likely to be less effective at 5.5 or 9 than it is at a pH near neutral (pH 7).

pH does become important with raw materials that have a high percentage of nitrogen (e.g. *manure* and *biosolids*).

A high pH, above 8.5, encourages the conversion of nitrogen compounds into *ammonia* gas, resulting in nitrogen loss from the compost (Figure 1).

Loss of nitrogen in the form of ammonia to the atmosphere not only

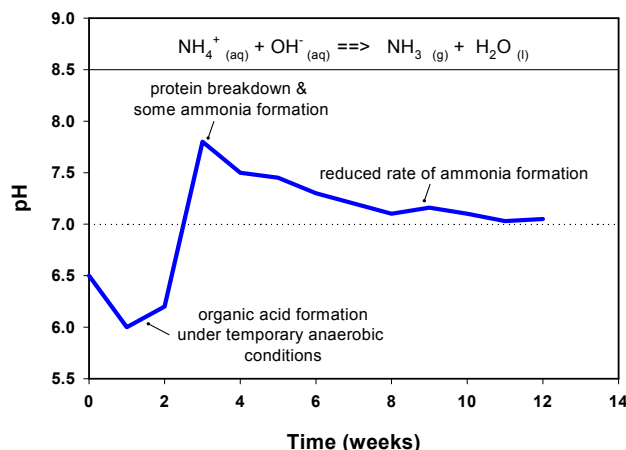
‘In the initial stages of composting, the pH falls due to the release of organic acids from decaying organic matter. Over time, the pH rises as organic acids are broken down, and the pH usually approaches neutrality (pH 7) during the maturation phase.’

causes nuisance odours, but also reduces the nutrient value of the compost.

Adjusting the pH downward below 8.0 reduces ammonia loss. This can be achieved by getting the right balances of materials in the compost recipe, or by adding an acidifying agent, such as superphosphate or elemental sulfur.

An outer layer of compost, used with *aerated static piles* and *passively aerated windrows*, helps to reduce ammonia loss. The (moist) particles in the layer retain ammonia as it

Figure 1. Typical changes in pH during the composting process (Gray and Biddlestone, 1971). Note that above pH 8.5, ammonia formation occurs. This results in nuisance odour production and a reduction in the nutritional value of the compost.



passes out of the pile.

The ammonia is converted to less mobile forms of nitrogen in the cooler and more stable environment of the outer layer (Rynk *et al.*, 1992).

The biofiltration of nitrogen occurs best when the moisture content of the outer layer of mature compost is maintained at around 60%.

Definitions*

pH

A measure of the concentration of hydrogen ions in a solution. pH is expressed as a negative exponent. Material that has a pH of 8 has ten times fewer hydrogen ions than a material with a pH of 7. The lower the pH, the more hydrogen ions are present, and the more acidic the material is. The higher the pH, the fewer hydrogen ions present, and the more basic it is. A pH of 7 is considered neutral.

Manure

The fecal and urinary excretion of livestock and poultry. Sometimes referred to as livestock waste. This material may also contain bedding, spilled feed, water or soil.

Biosolids

Organic solids or semi-solids produced by municipal sewage treatment processes. Solids become biosolids when they come out of an anaerobic digester or other treatment process and can be beneficially used. Until such solids are suitable for beneficial use they are defined as wastewater solids. The solids content in biosolids

should be equal to or greater than 0.5% weight by volume (w/v). Biosolids are commonly co-composted with garden organics and/or residual wood and timber to produce range of recycled organics products.

Ammonia (NH₃)

A gaseous compound comprised of nitrogen and hydrogen. Ammonia, which has a (sharp) pungent odour, is commonly formed from organic nitrogen compounds during composting.

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.

Passively Aerated Windrow

A composting method in which windrows are constructed over a series of perforated plastic pipes, which serve as air ducts for passive aeration. Windrows are not turned.

* Recycled Organics Unit, (2002).

Important references

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Acknowledgement

The Recycled Organics Unit acknowledges the support of Resource NSW in funding the development of this package of information resources, thereby enabling the Recycled Organics Unit to make these publications freely available for global access via internet publication.

Note this Information Sheet is partly based on content published in the *Best Practice Guide—Composting Green Organics* by EcoRecycle Victoria (1998). The Recycled Organics Unit acknowledges the excellent work involved in the original publication by the Institute for Horticultural Development (Department of Natural Resources and Environment, Victoria) and thanks EcoRecycle for supporting the significant adaptation and expansion of the original publication for broader Australian and international application.

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