



Guidelines

Specification for the Use of Quality Compost in Growing Media

European Quality Assurance Scheme

ECN-QAS

Part D

European Compost Network ECN e.V.
www.compostnetwork.info



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European Quality Assurance Scheme for Compost and Digestate (ECN-QAS)

The ECN Quality Manual 'ECN-QAS - European Quality Assurance Scheme for Compost and Digestate' (2014), lays down harmonised requirements for national certification bodies and quality criteria for recycled materials from organic resources. The aim is to facilitate the free cross-border movement of composts and digestate made out of recycled bio-wastes within the EU. The ECN-QAS is registered as 'Trade Mark' for certified quality assurance organisations, compost and digestate products at the European Register of Community Trade Marks ('OHIM 2012/210: TM No 011007168').

The ECN-QAS Quality Manual can be accessed here: www.ecn-qas.eu

Guidelines

I - Specification for Use of Quality Compost in Growing Media

Part D of the ECN Quality Manual 'ECN-QAS - European Quality Assurance Scheme for Compost and Digestate'

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1 Introduction

The European Compost Network is the leading European membership organisation promoting sustainable recycling practices in composting, anaerobic digestion and other biological treatment processes of organic resources. Its purpose is to work with practitioners, researchers, technicians and policy makers to deliver integrated organic waste recycling solutions that generate high quality products for the benefit of the environment and users of these recycled products. It serves as a central resource and network for the organic waste recycling sector in Europe, as well as the emerging bio-based economy.

ECN launched its Quality Assurance Scheme (ECN-QAS) in 2010 setting quality criteria for input materials, the composting/anaerobic digestion treatment process and the resultant compost/digestate. The ECN-QAS is registered as a Trade Mark for certified quality assurance organisations, compost and digestate products at the European Register of Community Trade Marks ('OHIM 2012/210: TM No 011007168').

There is currently interest in using quality assured compost as a constituent in horticultural growing media¹, where it may be blended with other materials (such as peat, bark or loam) to create a substrate suitable for germinating seeds, propagating cuttings and growing plants. Growing media may be used by both professionals and amateurs in horticulture and hobby gardening applications.

Compost used as a constituent in a growing medium mix needs to consistently meet high quality specifications and exhibit defined physical, chemical and biological properties specified by a growing media manufacturer or plant grower. The precise quality specifications will, however, depend upon the specific growing medium mix (for example, the substrates the compost is blended with), as well as the types of plants that will be grown in it.



Growing media use in greenhouse production

¹ 'Growing medium' is the term used for a single substrate mix, whilst 'growing media' is the plural and refers to more than one substrate mix.

2 Scope

These guidelines set out suggested minimum quality criteria for compost when used as a constituent in horticultural growing media. They apply to composted material prior to blending with other substrates and not the final growing medium mix. Additional quality criteria may therefore be required depending upon the intended use of the growing medium, especially if used in professional applications². Due to the wide range of potential growing media products, these guidelines are not intended to be prescriptive; instead they set out desirable quality criteria that are recognised as being important in the formulation of horticultural growing media (for example, the compost's electrical conductivity, stability and plant response).

Compost manufactured in accordance with this guideline will not be certified separately by ECN; compost certification remains subject to the Part C I (European Quality Assurance Scheme ECN-QAS for Compost); however, these guidelines should be read alongside Part C I of the ECN-QAS. Reference to Part C I of the ECN-QAS is made throughout this document.

In order for compost to be used as a constituent in growing media, additional quality criteria have been suggested. These are either more stringent, or are in addition to, the limit values specified in Section Part C I of the ECN-QAS Quality Manual. They include the following criteria:

- Physical contaminants (Undesired ingredients and properties)
 - Total of glass, metal & plastics
 - Stones
 - Weed seeds
- Chemical properties
 - Salinity / electrical conductivity
 - Na⁺
 - Cl⁻
- Material properties
 - Organic matter content
 - Maximum particle size
 - Stability
 - pH value
- Plant response
 - Plant response tests



ECN Quality Label for compost

² Examples of additional quality criteria are listed in the references section of this document.

3 Definitions

The definitions specified in the ECN Quality Assurance Scheme (ECN-QAS) manual Part C I Section 2 apply.

The ECN-QAS Manual is available on the ECN-QAS website for download:
www.ecn-qas.eu/ecn-qas-manual



ECN-QAS Quality Manual

4 Input Materials

Compost used as a constituent in growing media shall be manufactured from separately collected biodegradable materials as defined in the ECN-QAS Part C I Section 3.2 (Input Materials).

Input materials specified in the ECN-QAS Annex C I 2 are permitted, with the exception of EWC code 02 01 06 (animal faeces, urine and manure, effluent, collected separately and treated off-site), which is prohibited.

Sewage sludge and mixed municipal waste (i.e. municipal waste that has not been segregated at source, such that the biodegradable fraction has been mixed, combined or contaminated with other potentially polluting waste, products or materials) remain excluded. This is in line with the proposed requirements for the Component Material Category 3 (CMC 3) 'Compost' of the proposal for an EU Fertilising Product Regulation [COM (2016) 157 final]³.

³ EC 2016:COM(2016) 157 final: Circular Economy Package - Proposal for a Regulation of the European Parliament and of the Council laying down rules on the making available on the market of CE marked fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009

5 Specific Quality Criteria for the Use of Compost in Growing Media

5.1 General Compost Quality

Compost shall be manufactured in accordance with the operational criteria specified in the ECN-QAS Part C I Section 3 (Operational Quality) and certified by the ECN-QAS as specified in Part C I Section 5 (Certification Process).

5.2 Compost Quality Criteria

5.2.1 Precautionary criteria (limit values)

Levels of contaminants that may harm either end users or the environment have been specified. The limit levels for hygienic quality (*Salmonellae* spp.) and potentially toxic elements (inorganic pollutants) have been reproduced from the ECN-QAS Part C I. These are all specified in Table 1.

Table 1 – Contaminant limit levels		
Precautionary quality criteria	Parameter	Limit value
Hygiene	<i>Salmonellae</i> spp.	Absent in 25 g dry matter
Physical contaminants* (Undesired ingredients and properties)	Impurities (glass, metal & plastics) >2 mm *	≤ 0,25 % dry matter
	Stones >5 mm	< 4% dry matter
	Weed seeds	≤ 1 seeds per litre
Inorganic pollutants (Potentially toxic elements)	Lead (Pb)	130 mg kg ⁻¹ dry matter
	Cadmium (Cd)	1.3 mg kg ⁻¹ dry matter
	Chromium (Cr)	60 mg kg ⁻¹ dry matter
	Copper (Cu) **	300 mg kg ⁻¹ dry matter
	Nickel (Ni)	40 mg kg ⁻¹ dry matter
	Mercury (Hg)	0.45 mg kg ⁻¹ dry matter
	Zinc (Zn) **	600 mg kg ⁻¹ dry matter
* Limit levels for physical contaminants differ from those specified in the ECN-QAS Part C I.		
** Copper (Cu) and Zinc (Zn) are also considered as trace elements. Values exceeding 110 mg Cu kg ⁻¹ dry matter and 400 mg Zn kg ⁻¹ dry matter must be declared.		

5.2.2 Compost properties

Compost shall meet the minimum quality criteria specified in Table 2.

Concentrations of the soluble macronutrients nitrogen, potassium and phosphorus shall be declared. Concentrations of micronutrients (e.g. magnesium) shall also be declared if present in beneficial amounts.

Table 2 – Minimum quality criteria

Quality criteria	Parameter	Limit	Value
Chemical properties	Na ⁺	mg / l	≤ 250
	Cl ⁻	mg / l	≤ 750
Electrical Conductivity	Salinity / electrical conductivity	[mS/m]	≤ 190
Material properties	Organic matter	[% DM]	≥ 15 %
	Stability* Oxygen Uptake Rate (OUR) or Stability* Self-heating test	m mol O ₂ / kgOM / h Rottegrad index	≤ 15 V
	pH _(H₂O) value	-	≥ 4 and ≤ 9
	Plant response**	Plant response test** Long term growth test with Chinese cabbage or Plant response test** Short term growth test using cress	Average Germination Rate (%), biomass production Germination rate (%) Index for root length development (%)

* Stability testing – compost producers may choose which test method (either the oxygen uptake rate and/or self-heating test) to use. It is recommended that producers declare stability based on a single test method to ensure consistency between batches and to standardise reporting. If both test methods are employed, then both values shall be declared.

** Plant response – compost producers may choose which test method (either the Long term growth test with Chinese cabbage or the Short term growth test using cress) to use. It is recommended that producers declare plant response based on a single test method to ensure consistency between batches and to standardise reporting. If both test methods are employed, then both values shall be declared.

The aim of these methods is to test compost for substances that may adversely affect seed germination and plant growth in a compost-containing growing medium blend compared with a control compost-free growing medium. (The control is usually a standard peat growing medium. Different mixture rates are included in the standard test method EN 16086-1). It provides an indication of phytotoxicity and (indirectly) compost maturity.

5.3 Compost analysis

Compost shall be analysed in accordance with the ECN-QAS Part C I Section 4.3 (Compost Analysis).

5.3.1 Sampling

Compost shall be sampled in accordance with the ECN-QAS Part C I Section 4.3.1 (Sampling).

5.3.2 Analytical test methods

Compost shall be tested in accordance with the ECN-QAS Part C I Section 4.3.2 (Analytical Test Methods), including sub-sections 4.3.2.1 (Terms and Definitions) and 4.3.2.2 (Test Methods).

In addition, the methods specified in Table 3 shall be used.

Table 3 – Specified analytical test methods	
Testing parameters	Methods
Chemical properties	
Electrical conductivity	EN 13038
Na ⁺	EN 13652
Cl ⁻	EN 13652
Material properties	
Stability (Oxygen Uptake Rate [OUR])	EN 16087-1
Self-heating test (Rottegrad)	EN 16087-2
Plant response tests	
Pot growth test with Chinese cabbage	EN 16086-1
Petri dish test using cress	EN 16086-2

5.3.3 Approval of laboratory

Analytical laboratories shall be approved in accordance with the ECN-QAS Part C I Section 4.3.3 (Approval of Laboratory).

5.4 Compost storage

Compost shall be stored in accordance with the ECN-QAS Part C I Section 4.4 (Compost Storage) and the additional guidelines suggested in Section 6 below.

5.5 Compost declaration and labelling

Compost shall be labelled in accordance with the ECN-QAS Part C I Section 4.5 (Compost Declaration and Labelling).

With regard to the specific requirements for the use of compost in growing media the quality criteria specified in Table 4 shall be declared⁴.

In addition, specific information relevant to its use as an ingredient in a growing medium mix shall also be provided (for example, nutrient content and liming potential) if requested by the growing media manufacturer.

Table 4 – Minimum quality criteria declaration

Quality criteria	Parameter	Declaration	Limit
Chemical properties	Na ⁺	Conformance with limit level	≤ 250 mg / l
	Cl ⁻	Conformance with limit level	≤ 750 mg / l
Material properties	Organic matter	Conformance with limit level	≥ 15% dry matter
	Stability	Conformance with limit level Test method used	OUR ≤ 15 m mol O ₂ /kg OM / h or Rottegrad Index V
	Salinity / electrical conductivity	Conformance with limit level	≤ 190 mS/m
	pH _(H2O) value	Conformance within minimum and maximum limit levels	≥ 4 and ≤ 9
Plant response	Plant response test Long term growth test	Conformance with limit level: Average Germination Rate (%), biomass production	≥ 80
	Plant response test Short term growth test	Conformance with limit level: Germination rate (%) and Index for root length development (%)	≥ 80 and ≥ 80

⁴ Additional quality criteria to those specified in Table 4 may also need to be declared, especially if the compost is used in professional growing media formulations.

6 Guidelines for the blending of compost into growing media (Informative)

6.1 Growing media characteristics

A growing medium is a material, other than soil in situ, in which plants are grown and is a mixture of different materials, such as compost, peat, lime, fertiliser and wetting agents. Some media are used to grow plants in containers, whilst others are used to improve soil conditions when planting trees, bushes or acidophilic plants in gardens. It is sometimes also referred to as a 'substrate' or 'potting soil'.

Growing media are widely used in the professional horticulture and amateur gardening sectors for germinating seeds, propagating cuttings and growing plants. They need to have certain characteristics that provide plants with the following:

- A suitable matrix to enable roots to grow so that they can support the plant;
- Sufficient porosity to enable air to diffuse into and within the matrix to allow roots to respire;
- Sufficient water holding capacity;
- Sufficient macro- and micro-nutrients; and
- Sufficient cation exchange and buffering capacity to provide nutrient release over an extended period of time and to help buffer tap water characteristics (pH value).

In addition, they also need to be free of weeds, pathogens and pests, as well as being safe to handle and use.

The technical properties of any particular growing medium will depend upon its intended use.

Peat is commonly used as a component in growing media, as it is inherently low in plant nutrients and has a relatively low bulk density (compared to composted material). However, environmental concerns about the extraction and use of peat mean that growing media manufacturers are now creating reduced-peat and peat-free blends using a variety of materials, such as compost, bark, and coir.

Compost is rarely, if ever, used on its own as a growing medium. Instead, it is blended with other materials to create specific product types. Some of the properties of compost that need to be considered when assessing its suitability as a growing medium component are described below.

6.2 Desirable compost properties

6.2.1 Particle size and bulk density

Compost used in growing media needs to be screened to remove large fragments of partially composted material, as these can impede root growth, hinder blending and adversely affect its handling properties.

Most compost has a high bulk density compared to peat, which can adversely affect its handling, transportation and air-filled porosity. Compost used in growing media should have bulk density of less than 650 g/l.

6.2.2 Electrical conductivity/salinity

Compost, especially if manufactured out of a food waste feedstock, tends to have a higher electrical conductivity (salinity) than peat due to the presence of higher concentrations of potassium, sodium and chloride ions. High electrical conductivity can be problematic in growing media, as it can stunt growth, especially in young plants. Ideally compost used in a growing medium should have electrical conductivity levels as low as practically possible. Manufacturing compost out of woody (lignin-rich) feedstocks, which tend to have lower electrical conductivity than food waste-derived composts, can help achieve this.

6.2.3 pH

Compost tends to have an alkaline pH (between 7.0 and 9.0), which can affect the availability of nutrients.

6.2.4 Contamination

Manufacturers of growing media will not tolerate contamination in any form. Rigorous feedstock acceptance procedures (to minimise incoming contamination) and processing operations (such as handpicking, product screening and appropriate temperature-time profiles) should be implemented and applied consistently.

6.2.5 Stability, maturity and storage

It is important to ensure that any compost intended for use in a growing medium mix has been composted for a long enough period of time to ensure that:

- It is sufficiently stable, so that the rate of microbial decomposition has peaked and reduced to such a level that it will not continue to decompose appreciably once mixed with other substrates and bagged. Unstable compost can release by-products that are toxic to plants, create odours and heat up.
- It is sufficiently mature. The process of maturation involves the re-colonisation of mesophilic micro-organisms, the oxidation of ammonia into nitrate and the decomposition of phytotoxic composting by-products.
- Compost that will be used as a constituent in a growing medium mix needs to be stored undercover in order to:
 - Prevent it from becoming wet, as this will affect its bulk density and handling properties;
 - Prevent it becoming contaminated with wind-blown seeds; and
 - Reduce the likelihood of it becoming contaminated with bird and rodent droppings.

6.3 Suggested mixing/blending rates

Due to its inherent physical, chemical and biological properties the proportions dependent upon the properties of the other materials with which it is blended and the intended end use of the product.

In general, growing media used to germinate seeds, should have low levels of compost (typically 5-10% by volume), whilst multipurpose growing media can contain between 20-40% by volume.

7 References (Informative)

Europe

ECN-QAS - European Quality Assurance Scheme for Compost and Digestate

- <https://www.compostnetwork.info/ecn-qas/ecn-qas-manual/>

Germany

Quality mark and guidelines for growing media substrates:

- <https://www.substrate-ev.org/infos-zu-kriterien/growing-media/?lang=en>
- <https://www.substrate-ev.org/wp-content/uploads/2017/05/QualityParameters-GrowingMedia.pdf>

Netherlands

Quality mark for growing media substrates:

- <https://www.rhp.nl/en/which-quality-marks-exist-certified-companies>

United Kingdom

Growing media specification and guidelines:

- [WRAP 2014: Guidelines for the Specification of Quality Compost for Use in Growing Media](#)
- [WRAP 2014: Compost Production for Use in Growing Media – a Good Practice Guide](#)
- [WRAP 2016: De-mystifying the use of PAS100 compost in horticultural growing media](#)



Growing media use in greenhouse production



Growing media use on roofs



Growing media use in urban gardening

