Technical guide
2026 | Kosovo | No. 1839

Use of compost in medicinal and aromatic plant production

Benefits and good practice

Quality compost can bring many benefits to soil and plants. By providing organic matter, it supports healthier, more resilient plants with better growth and increased resistance to pathogens and environmental stresses. But unhealthy compost can be detrimental to plant growth.

This short guide explains the benefits of compost and how to best use it in medicinal and aromatic plant production to obtain healthy and abundant harvests.

Why compost?

Soil-borne pathogenic fungi and bacteria can pose a challenge in the production of medicinal and aromatic plants (MAPs) due to intensive cultivation methods, especially when several crops from the same plant family are included in the crop rotation. One possible preventive measure is to add antagonistic microorganisms to the soil through the use of compost, which can suppress pathogens such as *Pythium* and *Rhizoctonia*.

Compost is a valuable soil amendment. It plays an essential role in maintaining soil health and fertility, particularly in intensive MAP cultivation.

Using compost reduces the need for fertilisers, thus decreasing production costs. It also enhances the effectiveness of animal manure, even in small quantities, when used in conjunction with it. Compost can also be used to recover degraded soils.

What is compost?
Compost is the product that results from the controlled decomposition of plant and animal (mainly manure) materials. Compared with uncontrolled decomposition of organic material, composting accelerates the process and produces a higher-quality end product. The high temperatures in the composting process kill most weeds, pests and disease-causing organisms.

One could say that mature compost is a prestage of humus that is ready to be incorporated into the soil and to form true humus over a short time.

FiBL
CARITAS Schweiz Suisse Svizzera Svizra
Austrian Development Cooperation

What are the benefits of compost?

Soil fertility improvement

Compost **increases the soil's organic matter content**. This improves the soil's structure and its ability to infiltrate and hold water (thereby improving its drought mitigation). It is estimated that an additional 1 percent of organic matter in the soil can store an extra 15 to 20 litres of rain per square metre. This makes it especially valuable in dry climates. Compost also helps to prevent nitrogen loss in temporarily waterlogged soils.

Compost **nourishes and stimulates soil biodiversity**, such as earthworms, bacteria and fungi. This improves the decomposition of plant residues, which is essential for the proper cycling of nutrients.

Pathogen suppression

Compost can reduce the incidence of many common diseases affecting MAPs, including those caused by *Fusarium*, *Pythium*, *Phytophthora*, *Verticillium*, *Rhizoctonia*, as well as some nematodes and bacterial/foliar diseases.

The suppressive effect is primarily biological due to **beneficial microorganisms** that are **introduced or stimulated** by compost. Disease suppression occurs through mechanisms such as the activity of beneficial microbes, competition for nutrients, the production of antibiotics and direct predation or parasitism. Compost-dwelling microbes also produce enzymes that break down pathogen cell walls and release compounds like ammonia and organic acids that inhibit pathogen growth. Additionally, compost can induce systemic resistance in plants, enhancing their ability to defend against pathogens.

Composts that are rich in lignin-containing materials, such as wood, are known to have a higher suppressive capacity.

This experiment demonstrates the effect of compost on soil quality and crop nutrition. In this field, repeated cultivation of spinach resulted in growth disorders due to a condition known as "spinach fatigue". However, a single application of compost (centre-right plot) significantly improved the spinach's growth.

Nutrient supply

With a pH level ranging from 6 to 8, compost **balances the soil's acidity**. This improves the availability of nutrients in the soil and reduces deficiencies of trace elements.

Compost helps to **stabilise overall nutrient levels** and regulate the mineralisation and immobilisation of elements such as nitrogen and phosphorus. As microorganisms decompose the organic matter, nutrients in compost are released slowly over time, providing a gradual and sustained supply to plants.

Nitrogen: Around 10 percent of the total nitrogen (N) is generally available in the first year, with the remainder being bound to organic matter. When it comes to vermicompost and digestate containing more mineral nitrogen, 20 percent of the total nitrogen can be included in the fertilisation balance.

Phosphorus: The phosphorus (P) content of compost can vary significantly depending on the initial materials used and the composting process. Most of the phosphorus is not immediately available to plants. Analyses provide clarity about the concentrations of the various forms of phosphorus present in compost. These results allow conclusions to be drawn about its fertilising effect.

Potassium: Compost generally has a variable but low to moderate potassium (K) content, which is mostly water-soluble and readily available to plants. Because potassium is readily available, applying compost at rates needed for nitrogen or phosphorus can lead to an excess input of K, which can disrupt the nutrient balance in plants.

Micronutrients: Compost also provides essential micronutrients like calcium, magnesium, iron, and zinc, which are vital for plant function.

How to assess compost quality?

The quality of the compost must be assessed when using it for sensitive crops, such as herbs. It is important to assess the quality of compost in order to avoid the introduction of contaminants such as heavy metals, pathogens or toxic ingredients. Compost quality can be assessed through simple observations, quick tests or a field laboratory.

Sensory observation

- **Colour:** Mature compost has a homogeneous brown to black colour. A dark colour indicates sufficient decomposition and the presence of humus. In contrast, young compost shows a mosaic of colours.
- **Odour:** Mature compost has a rich, earthy smell and is free from ammonia or unpleasant odours. "Rotten" smells such as that of rotten eggs or butyric acid, indicate anaerobic conditions and poor quality. A smell of ammonia indicates young, nitrogen-rich compost.
- Consistent **particle size:** Mature compost should have a relatively uniform, fine texture, indicating complete decomposition. The presence of fibrous material suggests that the compost is young and may lead to nitrogen being immobilised in the soil.
- **Moisture content:** To support microbial activity, the compost should be moist but not waterlogged.

Analytical assessment

- **pH:** Mature compost typically has a moderate pH (between 6 and 8), making it suitable for most plant growth.

The closed watercress test is a reliable method of assessing the potential toxicity of compost to plants (left: commercial potting soil; right: low-quality compost). Only high-quality composts perform well in this test, enabling good seedling development. 5 days after sowing watercress or lettuce seeds, the length of the seedlings' roots is measured. If the root length of seedlings grown in the compost is more than 75 per cent of that of seedlings grown in commercial potting soil, the compost is highly compatible with plants.

- **Soluble salts content:** The salt content can vary depending on the original inputs and may limit the growth of certain sensitive crops. To prevent harm to plants, electrical conductivity should be kept low.
- **Mineral nitrogen content (N_{min}):** Mature compost mainly contains nitrate (NO_3). In contrast, young compost mainly contains ammonium (NH_4). A high quantity of nitrites (NO_2) indicates a lack of oxygen and poor quality.
- **Carbon-to-Nitrogen (C : N) ratio:** An ideal C : N ratio is between 15 : 1 and 20 : 1. A higher ratio (indicating a compost that is richer in carbon) can lead to the immobilisation of available nitrogen in the soil.

The fist test is a simple method of assessing the moisture content of compost. Take a handful of compost and firmly compress it in your fist. If the ball falls apart, the compost is too dry. If it remains compact, the moisture content is optimal. If water flows out, the compost is too wet.

How to use compost?

For an efficient use of compost, the following aspects need to be considered:

- **Objective:** If the main objective is to fertilise crops, it is recommended to use a nutrient-rich compost (e. g., vermicompost or compost mixed with manure). For long-term soil quality and fertility, a mature compost containing an appropriate amount of woody material is suitable (e.g. green waste compost or compost containing biochar). Herbs can be sensitive to excessive nitrogen, so balanced fertilisation is important. Ideally, well-decomposed compost is used that does not contain too much ammonia.
- **Application time:** For perennial crops, such as medicinal and aromatic plants, repeated application of compost every 2 to 3 years is recommended. For annual crops, it is recommended that compost is applied to the preceding green manure or before seedbed preparation.
- **Scaling:** The amount of compost used should not exceed the crops' phosphorus requirements for the next three years. When applied to planting holes, the compost should be mixed with soil at a ratio of two parts soil to one part compost, as pure compost may damage plant roots.
- **Spacial application:** For ridge-grown perennial MAPs with wide interrows, such as thyme, targeted application of compost along planting lines is recommended to concentrate the compost's benefits in the active root area. For short-cycle or densely planted species, even distribution over the entire field surface is recommended to ensure a homogeneous nutrient supply and even crop growth.
- **Incorporation:** The compost should be quickly mixed into the topsoil (e.g. through shallow tillage) to prevent it from drying out, and losing nutrients and biological activity. In medium to heavy soils in particular, the compost should only be incorporated to a depth of 5–10 cm and not be ploughed deeply into the soil. Watering promotes its connection with the soil.

Table 1: Indicative compost requirements of crops*

Crops (examples)	Available N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	Compost (m^3/ha)	Comments
Chamomile	40	60	80	~10–12	Determined by K_2O
Nettle	100	80	120	~25–30	Apply every 2–3 years, add another source for N
Lavender	40	30	60	~10–15	Apply every 2–3 years
Peppermint	60	40	80	~15–20	Apply every 2–3 years

* The values should be adjusted based on soil and compost analyses, as well as local agricultural advice. The C/N ratio of a mature compost is approx. 12 to 18. Available N content is about 10 % of total N content. 1 m^3 of compost is equivalent to approximately 0.8 ton.

Imprint

Publishers
Research Institute of Organic Agriculture FiBL
Ackerstrasse 113, P.O. Box 219, 5070 Frick, Switzerland
Tel. +41 (0)62 865 72 72, info.suisse@fibl.org, fibl.org

Caritas Switzerland
Adligenswilerstrasse 15, P.O. Box, 6002 Lucerne, Switzerland
Tel. +41 (0)41 419 22 22, info@caritas.ch, caritas.ch

Author: Nicolas Lefebvre (FiBL Switzerland)

Review: Jacques Fuchs and Anja Vieweger (both FiBL Switzerland)

Editor: Gilles Weidmann (FiBL Switzerland)

Design: Sandra Walti (FiBL Switzerland)

Photos: Jacques Fuchs (FiBL): page 3; Audrey Meyer (FiBL): p. 2; Oleksandr Todorov: p. 1

FiBL item no.: 1839 **Permalink:** orgprints.org/id/eprint/56453/

Acknowldgements: This technical guide was developed by FiBL within the framework of the EREA project, implemented by Caritas Switzerland and funded by the Austrian Development Cooperation (ADC).