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COMPOST: VERMICOMPOST

This factsheet contains complementary information to the Best4Soil video on Compost: Vermicompost

INTRODUCTION

Compost is part of the natural cycle. It is a result of microbial decomposition of dead organic matter under the influence of oxygen (aerobic conditions). Apart from thermophilic compost, which can generate temperatures of 65 °C and more, vermicompost is produced at ambient temperatures using epigeic earthworms (fig. 1), key organisms for the production of high quality compost. This method mimics nature and results in a compost with a diverse microbial community, which would otherwise be killed through the temperatures occurring in thermophilic compost heaps.

Fig. 1: Epigeic earthworms in vermicompost

Difference to thermophilic compost

While turning is a key step in the process to produce thermophilic compost, mechanical disturbance is not allowed for vermicomposting (Dominguez and Edwards, 2010) as the action of the worms aerates the material. These composts differ in both production systems and in the characteristics of the materials produced. Vermicompost usually is higher in total nutrients (because of increased volume reduction during processing), but also has a higher proportion of plant available nutrients. The microbiome (community of microbes) is more diverse than in thermophilic compost, because the high temperature kills a lot of organisms in the compost heap. Vermicompost contains significant amounts of phytohormones (like auxin, gibberellin and cytokinin), which are e.g., produced by bacteria of the genus Pseudomonas spp., and promoting e.g. root growth. This can easily be seen in practice, when observing roots growing in earthworm burrows in a soil pit. Vermicompost is also considered to contain a range of plant growth promoting rhizobacteria (PGPR) (Vijayabharathi et al., 2015).

Production methods and technology

The vermicompost process does not kill weed seeds, therefore, it is critical to either avoid having seeds in the input material, or to use a combination of thermophilic and vermicomposting methods for production. In temperate areas, vermicomposting can be done outdoors, but if harsh weather conditions (cold or hot) occur, the method should be conducted indoors and (because of the higher costs) in a continuous flow process (fig2), which is much more efficient than ground heaps. Continuous flow methods feed on one side (most often on top) and harvest from the bottom. Epigeic earthworms stay in the upper 15-20 cm if suitable, so when harvesting takes place at the bottom, earthworms do not have to be separated from end product.

Fig. 2: Continuous flow, indoor vermicomposting facility, Austria.

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Resources, mixtures, and environmental conditions

Input material (feedstock) for vermicomposting is critical. If the earthworms don't like their food/environment, they don't perform and eventually disappear. This is the number one reason why this technology has not been adopted more widely. Composting earthworms have some environmental requirements: Temperature 15-30°C, moisture content 60-80%, pH-level 6-8, fully aerobic conditions and enough food (C/N ratio 25:1) with loose structure. Most of the time, mixes from different resources have to be altered /diluted/ supplemented to fit the required quality.

Quality control and regulations

Control of quality is critical, either with compost produced on farm, or purchased. Sometimes earthworms may have not fully processed the organic resources. Compost and organic fertilizer production is not yet regulated by the European Union, therefore each country has its own national legislation and regulations. In some countries, vermicompost is considered compost, some countries regulate it as organic or organic-mineral fertilizer and some countries even have special regulations for vermicompost.

Usage and application

Due to the high input of time and resources into its production, the price for vermicompost does not compare to compost produced in the thermophilic manner. Therefore, application rates are much lower and should be reserved for high value crop production. Nowadays, research is being undertaken to use vermicompost or compost extracts from vermicompost for seed coating and other micro application methods, reducing the application rate of vermicompost to one liter per hectare. Use in seed drills, as an amendment for soil substrates, or when planting orchards (fig. 3) and vineyards is also common practice.

Fig. 3: Vermicompost is a valuable organic amendment and should be used in first line for high value crops such as orchards or vineyards.

References

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