



How to set up and manage a good compost

Dr. Jacques G. Fuchs, Biophyt Ltd., CH-5465 Mellikon

1. Biological basis

1.1. What is compost ?

Compost is the solid, crumble, brownish to dark brown product of an aerobic degradation of biogenic waste or organic material. There are huge numbers of microorganisms working under constant access of air (oxygen) and with sufficient moisture in the material mix. There is not only degradation, but also formation of new compounds.

Compost live. Compost has to be treated like a living organism. This means that we have to take care of it. A healthy compost can bring many advantages to the soil and to the plants, but an unhealthy compost can bring disadvantages for plant growth.

1.2. How does composting work ?

Two elements are especially important in the cycle of life and the composting process:

- carbon (source of energy)
- nitrogen (base for the protein formation)

If the ratio of available carbon and nitrogen (ratio C:N) is too high (too much carbon), the microorganisms do not have enough nitrogen to build up their population, and the degradation of the organic material cannot happen efficiently. If the C:N ratio is too low (too much nitrogen), the available nitrogen can't be used and is lost; in such a case we also often have emission of undesirable odors.

The C:N ratio at the beginning of the fermentation should be between 30 and 40.

Composting is the business of **numerous microorganisms** who are working together: bacteria, fungi, actinomycetes. Each has its job and needs the others to accomplish the composting.

Composting can be divided into two phases: the **degradation phase** (with heat development) and the **maturation phase**. The evolution of the different parameters during composting are presented on figure 1.

The **degradation phase** with heat development is very important for the killing of pathogens and weed seeds in the compost. For this reason it is important to turn the



compost at least three times during this period, so that each compost part was under the influence of the heat.

The stable humus is formed during the **maturation phase**. It is also in this phase that the nitrification takes place.

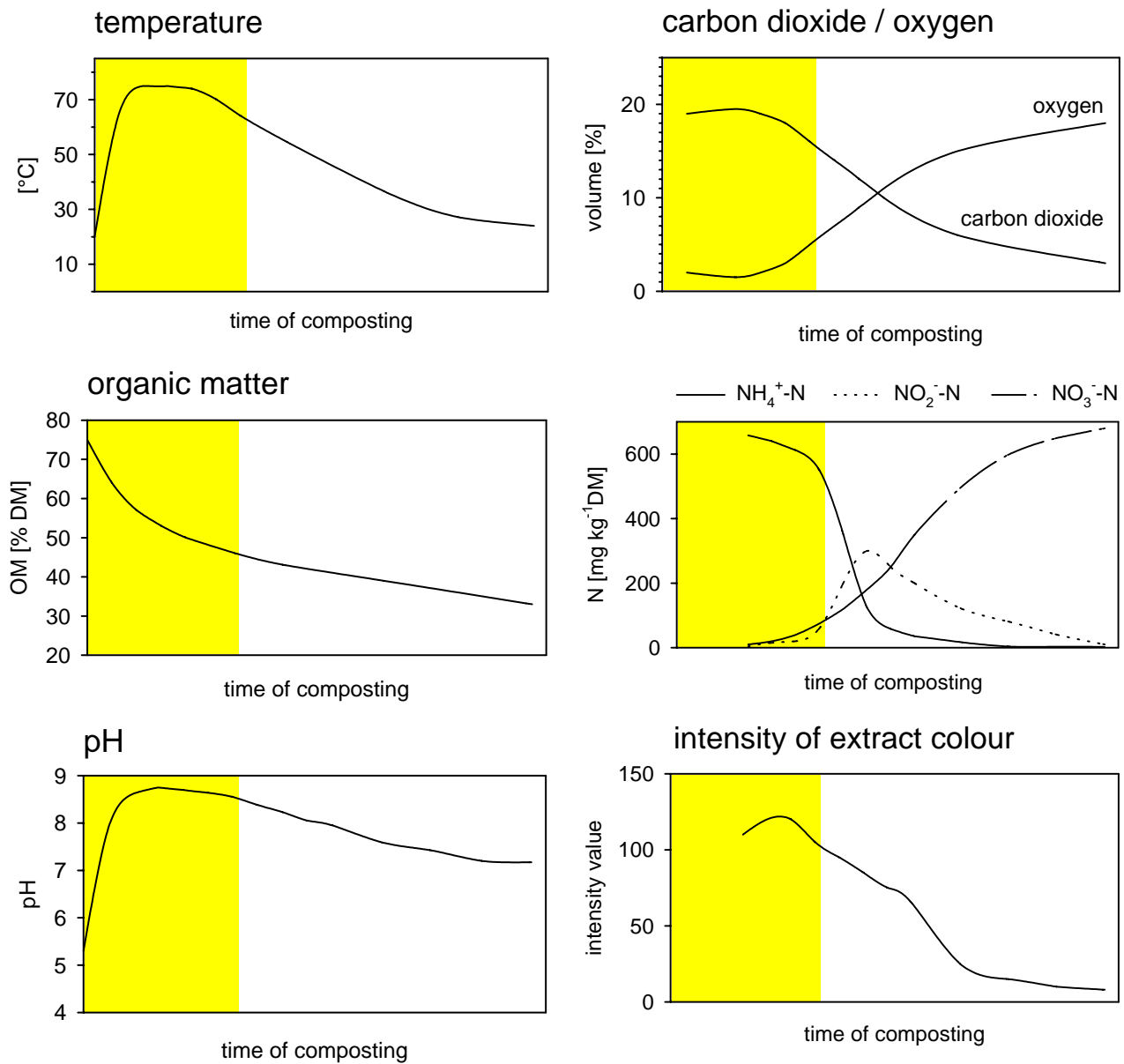


Fig. 1. Evolution of the most important parameters during the composting
Graphs: Dr. Ueli Galli, Terra Nova Umweltberatung GmbH, CH-Breitenbach



2. The secrets of producing good compost

To assure the production of good compost, it is important to control the entire process, from the collection of the green material to the storage of the final product and to its utilization.

2.1. Collection and mixture of the green material

The better the **quality of the green** material is, the easier is the compost to produce. The green material has to be collected and treated as freshly as possible. To obtain an optimal fermentation, the start mixture has to be adequate. The two most important points to control are the **C:N-ratio** (see chapter 1.2) and the **structure of the material mixture**. The desired structure depends of the composting system and especially of its dimensions. The structure has to be loose enough to allow enough air supply for the activity of the microorganism. On the other hand, two problems can occur if the structure is not compact enough: (1) no heat development and (2) a very fast drying of the material. The smaller the compost pile is, the finer the structure has to be.

To build up the compost pile, the different materials have to be distributed regularly along the pile and then mixed up twice with the compost turning machine, so that a homogenous mixture is obtained. If the mixture is too dry, it is necessary to moisten it, to allow the microorganisms to work.

2.2. Management of the fermentation

The two most important factors to control during the fermentation are the **moisture** of the material and the **air supply**. To control the humidity, it is important to take some material inside the pile. The control can be realized with the **humidity hand test**: take a handful of compost and press it as strongly as possible between the fingers. If water flows out, the compost is too wet. Open the fingers. If the compost ball disintegrates itself, the compost is too dry. If the compost ball stays compact, the compost moisture is optimal. The compost needs a lot of water during the heat phase. Once the temperature is decreasing, we have to be very careful with irrigating the compost, because it does not evaporate a lot of water any more, and it risks to become too wet.

To assure enough air supply, the compost has to be turned periodically. The turning frequency depends on the material and on the dimension of the pile. At the beginning of the fermentation, the turning frequency has to be one to two times per week. Later, when the biological activity decreases, the turning frequency can be reduced. To follow the activity of the process, it is important to measure periodically (twice each week) the **temperature** in the hot point of the compost pile and to protocol it. The evolution of the temperature tells us if the fermentation happens properly and how advanced the process is.



2.3. Storage and use of compost

Compost is a living material, also when it is mature. This means that it always needs enough air. Otherwise, it becomes anaerobic, and its desired microorganism die and toxic compounds develop. For this reason, it is important to store compost either in small piles and to turn them periodically (once each month), or to store them in larger piles with a forced aeration.

Compost use: it is important to choose the right compost for the right utilization. Compost has to be mixed up **in the top of the soil** (in the upper 5 to 10 cm), so that the positive action of their aerobic microorganisms can develop optimally.

3. Practical work on a compost production site

3.1. Making the compost piles

Distribute the raw materials to form the pile. Pay attention that the repartition of the different raw materials is equal on the entire pile. Then mix up the pile with the compost turning machine. Control the moisture and, if necessary, give some water. Then mix the pile a second time.

3.2. Control of the fermentation

Check whether the temperature increases. After some days, the temperature at the pile hot point has to be between 60°C 70°C, if the fermentation happens orderly. Turn the compost about once each week during the first 3-4 weeks. By each turning, control the moisture in the center of the pile. If needed, add water before and during turning. When after some weeks the temperature decreases, the interval between turnings can be extended.

3.3. Storage of the compost

During storage of the mature compost, take care that it obtains enough air. If the storage pile has a height of more than 200 cm, a forced ventilation should be used. If the height of the pile is less than 200 cm, the air supply can be managed by turning the pile approximately once per month.

3.4. Control of the compost quality and utilization of the compost

See ASCP Guidelines 2001. The technical possibility for the realization of the quality control of the compost will be discussed on place and a methods guide will be designed after this.