

GREEN CREW

**Διαχείριση Αποβλήτων και κομποστοποίηση
οργανικών υπολειμμάτων**

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Composting of Organic Wastes



The degradation of the organic substance as a biological process, and as it occurs in nature, it has two main drawbacks:

- It is a slow process
- Human intervention in order to influence the process is very difficult

Compost Definition

The process of biological degradation of organics residues and wastes, by human intervention; under controlled conditions, is attributed to the international term **composting**.

The material in which organic residues are converted into by the particular process is called internationally **compost** (compost) and is one organic (organo-chemical) soil conditioner.

Composting is the natural biological process of degradation of organic matter, in which human intervention has led to intensification & maximization of its performance. The process is **microbial, aerobic, thermophilic** and yields a stabilized combo product.

The main characteristics of the composting process

- **Microbial:** A large number of microorganisms (earthworms, mites, etc.) as well as a diverse and numerous combination of different microorganisms (fungi, bacteria, yeasts, actinomycetes etc.) are responsible for the degradation process of organic matter
- **Aerobic:** The presence of sufficient oxygen is necessary for the rapid, efficient and trouble-free degradation of the organic substance through the aerobic (mainly) abovementioned micro-organisms.
- **Thermophilic:** The result of microbial degradation is the production of energy, which leads to an increase in the temperature of the degradable materials.

What is stabilized compost?

The main characteristic of the dead organic matter is its instability, as it is constantly in the process of decomposing under certain favorable conditions.

By the Composting process we can achieve a more rapid decomposition and its passage to relative stabilization, in which its degradation continues but at a slow pace.

In this situation, no environmental problems are caused at the same time as it can be exploited in agriculture, but also in other uses.

Desirable materials for composting

- Plant and ornamental plant residues (branches, shoots)
- Various weeds (do not have mature seeds)
- Leaves
- Ground from pots (when their soil is renewed)
- Branches of trees and shrubs
- Cut grass from lawns
- Superior or damaged fruit
- Eggs from eggs
- Coffee residue (with filters) and tea residue
- Vegetable residues from cleaning them in the kitchen (potato stalks, beans, peas, beans, etc.)
- Remnants of cooked foods that have not been added to oil.
- Flowers from the cupboards
- Wood shavings & sawdust

Unwanted materials to be composting

- stones
- metal objects
- plastic
- glass
- printed paper
- food residues containing fats, meat, bones
- cleaning equipment
- remnants of affected crops or excessively sprinkled
- manure from animals treated with antibiotics
- large amounts of citrus peel
- pine needles

Brief History of Composting

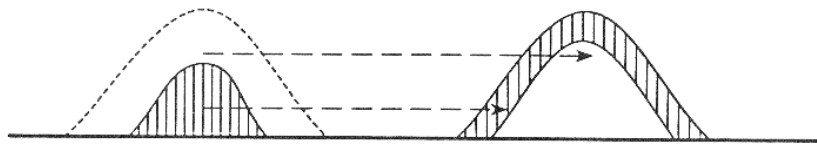
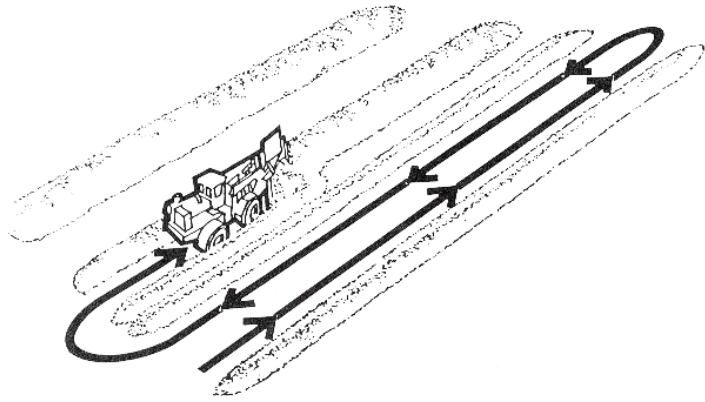
Composting is an ancient agricultural technique with the first depictions of work dating back to China here & 5000 years.

The 1st recorded improvement effort (1930-1940) was made by Sir Albert Howard in his cultivations in India by systematizing the work on farm & livestock residues.

Shortly afterwards, Waksman & his colleagues intensified the microbiology of composting, from the perspective of the hygiene of urban populations.

The systematic attempt to mechanize the process and its "productive" dimension in the context of solid waste management was initiated by Mr. Gotaas in 1956.

The technique & the factors that affect composting



Technique for windrows racking and reversing

Aerobic degradation of organic materials:

- a) Chopping
- b) Laying in series
- c) Ensure optimal conditions of O₂, N, & humidity

The technique & the factors that affect composting

1. The particle size of the organic matter

- It greatly affects microbial activity - increased surface effect
- It reduces air gaps thus allowing the prevalence of anaerobic conditions
- Ideal particle size: 1.5 - 7.5 cm

The technique & the factors that affect composting

2. Microflora

- The most important sums of microorganisms in composting are bacteria, fungi and actinomycetes
- This microflora is normally present in the waste, it is pre-existing in the soil, air and water, and it is usually not necessary to add a microflora contaminant to the line stacks of the organic wastes

The technique & the factors that affect composting

3. The humidity of composting rows

- The ideal moisture level varies according to the origin of the material to be decomposed
 - The moisture content of the series should not exceed 70%, as a gap between at least 30% is required for proper air circulation
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- Desired humidity = 45% for fine materials
 - Desired humidity = 60% for coarse materials

The technique & the factors that affect composting

4. C / N ratio (carbon / nitrogen)

- The various organic residues usually have a high C / N ratio
- The ideal value of the C / N ratio in the material to be digested is that of 30 / 1, since from 30 parts the microorganisms hold 1 / 3 to build their own cells and exhale 2 / 3 as CO₂.

The technique & the factors that affect composting

Characteristics of some raw organic materials

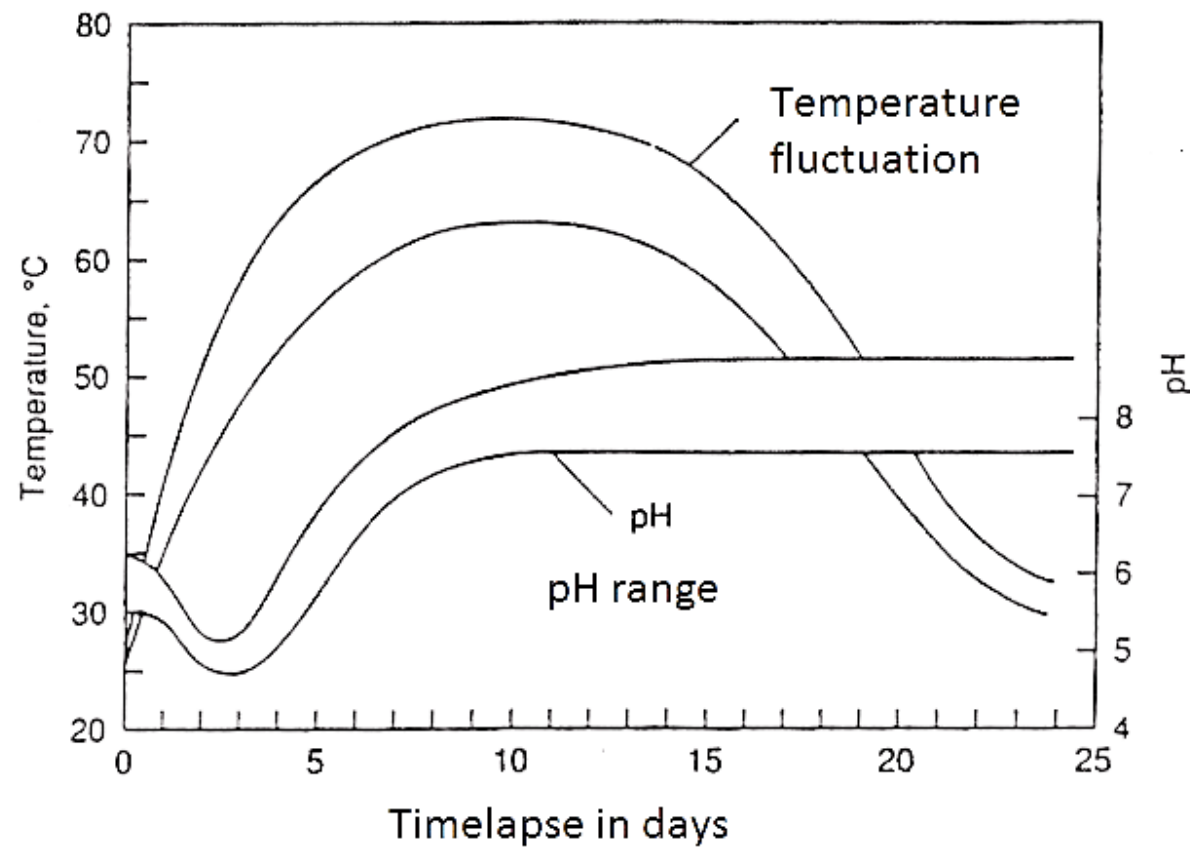
Raw materials	N (% Dry Volume)	C/N	Humidity (%)
Fish remains	6,5 - 10	4:1	80
Chicken manure	6,3	4:1	75
Remnants of meat	5,1	6:1	75
Fresh greens	4,0	12:1	95
Dried greens	2,4	19:1	40
Raw waste	2,15	25:1	90
Mixed wastes from gardens	2,0	20:1	80
Cattle manure	1,7	27:1	80
Seaweed	1,9	19:1	90
Fresh leaves	1,5	30:1	80
Oat straw	1,05	48:1	25
Dry leaves	1,0	45:1	40
Raw sawdust	0,25	208:1	5

The technique & the factors that affect composting

5. The pH of the composting windrows

- Ideal pH for composting is considered to be the one that is slightly alkaline since it favors the activity of bacteria without significantly limiting the activity of fungi
- However, it is not always necessary to correct the pH of the material as with the onset of digestion the pH rises to the slightly alkaline region mainly due to the release of ammonia and consequently this need is covered by the process itself

The technique & the factors that affect composting



The technique & the factors that affect composting

6. Composting temperature

- Immediately after the configuration of the series, the microbial action begins, which, with the release of energy, raises the heap's temperature as its outer layers act heat-insulated on the inside
- So in the first two or three 24 hours the temperature may exceed 70°C and be maintained at this level for several days
- After about 5-10 days, the temperature begins to drop due to the depletion of available oxygen or the decrease in humidity
- At this point it is necessary to manipulate the material to be oxygenated either by spraying the heap or by supplying air under pressure to the stack base or by sucking the entrapped gases into the mass of the material and replacing them with air
- The ideal temperature for microbial activity in compost heaps is considered to be between 50 and 65 °C

Quality - Applications of compost 1

- The quality of the compost depends mainly on the raw material and the correct process of composting
- Compost is used in two ways in agricultural practice
- One is for the improvement of cultivated lands and the other for the preparation of substrates for the development of horticultural and floricultural plants
- The addition of mature compost to the soil has positive effects due to the increase in organic soil, which means improving some of its physical and chemical characteristics such as:
 - the porosity
 - water capacity
 - the water / air relationship
 - the pH value
 - the available amount of nutrients, etc.

Quality - Applications of compost 2

Compost is used in the following situations:

1. As a soil enrichment material for the production of outdoor hotel ornamental plants instead of peat
2. In the plots of new gardens, when mixed with the new fertile soil in a ratio of 1 : 3 (compost : soil)
3. In the new lawn installations, instead of using peat, which must be free from weed seeds, otherwise we may encounter infestation problems
4. On old degraded lawns, due to intensive use by customers, the so-called "lid" is applied, that is, spreading surface-sieved compost and then sowing again