

SOME ASPECTS REGARDING THE MICROORGANISMS INVOLVED IN BIODEGRADABLE WASTE COMPOSTING

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Composting is one of the ecological methods of processing biodegradable waste via its transforming into a non-polluting product called compost, with high nutritional value for plants, which can be used for improving the physical and chemical properties of soils. Composting can be used in parallel or instead of the incineration and controlled storage techniques. The advantages of this method include: reduction of the waste volume, turning the waste into a product which is useful for the Republic of Moldova – compost for agriculture, horticulture and gardening.

Microorganisms (bacteria and fungi) have the leading role in the process of composting biodegradable waste. The involved bacteria and fungi can be classified into mesophiles and thermophiles. The mesophilic microorganisms (those that grow best at temperatures between 25-45°C) are dominant in the composting mass in the initial phase of the process when temperatures are relatively low. They use available oxygen to convert carbon from compostable materials into energy, thus producing CO₂, H₂O and heat as a result of metabolic processes. When the temperature approaches 45°C, the mesophilic microorganisms die or become inactive, waiting for the preferable conditions. The thermophilic microorganisms are active at temperatures between 45-70°C, when they rapidly multiply replacing the mesophiles in most sections of the compost pile. They usually appear after 5-10 days of composting and generate a much higher heat than the mesophylls. The temperatures reached with their help are high enough to inactivate most pathogens and weed seeds. The thermophilic bacteria continue to break down materials as long as there are nutrients and energy sources. When these sources diminish, the thermophiles die and the temperature in the piles begins to decrease. At this point, the mesophilic bacteria resume their activity in the decomposition process until all available sources of nutrients and energy are exhausted.

Bacteria are the first to colonize the compost pile and they break down primary proteins and carbohydrates faster than the other types of organisms. Among them there are *Bacillus mesentericus*, *Bacillus vulgatus*, *Bactehum vulgariae*, *Bacterium fluorescens*, *Micrococcus sulfureus*, *Micrococcus luteus*, *Streptococcus yogenes* etc., nitrifying bacteria, myxobacteria and pathogenic bacteria. The bacterium *Pseudomonas aeruginosa* is the most common microorganism in the composting process.

Fungi have an important role in composting too, but only when the pile starts to dry, because they can survive the environments with low humidity more easily than bacteria. Some types of fungi may require a smaller amount of nitrogen compared to bacteria, being thus able to break down cellulosic materials that bacteria cannot break down. Among the important fungal species, a lot of attention was given to the ones belonging to the genera *Aspergillus*. Among other important species are: *Mucor*, *Chaetocladium*, *Thamnidium*, *Microacus*, *Absidia*, *Helicostylum*, *Chaetomium*, *Circinella*, *Motierella* etc.

The factors that influence the composting process must be kept under control, namely: the composition of the residues, the moisture content of the waste, the oxygen concentration, the temperature. Among the auxiliary factors that influence the composting process, we can mention the homogeneity of the mixture; waste granulation; the way of placing the ground waste in piles or in fermentation containers.

The composting can be effectively used for neutralization of household waste, since it is much cheaper than storage in controlled ecological deposits or incineration. More than that, the use of composts in the agriculture can cause a 15% yield increase.