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CHARACTERISTICS OF WASTE SAMPLES - WOOD MATERIAL IN TERMS OF METAL CONTENT IN A COMPOSTING STATION

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Introduction

Organic waste has always been used to fertilize the soils, ever since man first settled down and began farming. On the other hand, nowadays, the increase in urbanization (55 % will live in urban areas in 2050) has led to an explosion in the quantity of urban waste resulting in serious problems for public health and environment. The historical link between the organic fraction of municipal solid waste and agriculture has thus largely been forgotten as a result of the intensification of agriculture and the hygienic management of urban waste. Recovery represents an enormous challenge for circular waste management, which aims to return organic matter to the soil to "close the loop" and thus save natural resources and reduce human impact on the environment. Composting is the controlled biological decomposition and stabilization of organic substances under conditions that allow biologically generated heat to raise levels that can destroy pathogens and seeds, this process resulting in a stable product that can be beneficially applied to the soil. It is a natural process that is influenced by several factors, such as the nature of the waste, environmental conditions, equipment and facilities for use and operational procedures. The studied composting station is designed to process biodegradable municipal waste. Monitored waste types included biodegradable waste and wood free of hazardous substances.

Materials and methods

Key factors influencing composting include: waste composition, biological reactions, temperature, moisture, oxygen and ventilation, and duration. The basic elements of composting are nitrogen, carbon, water, and air. The process is driven by microorganisms within the compost pile (Figure 1).

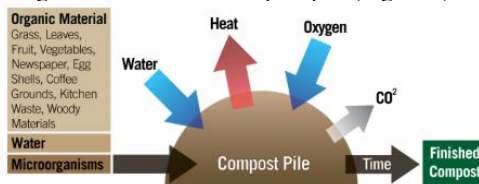


Figure 1. Stages of composting technologies

Composting conditions: Relative proportions of carbon and nitrogen; Particle size; Surface area and porosity; Moisture content it is between 40% and 60%. Essential

materials in the composting process are the relative proportions of carbon and nitrogen. The optimum carbon-nitrogen ratio for composting tends to be around 25:1 (+/- 5:1). Table 1 shows the carbon-nitrogen ratios in different materials. The main microorganisms involved in composting are aerobic bacteria and fungi.

Table 1. List of carbon-nitrogen ratios in various materials

Material	C(carbon) :	N(nitrogen):
Vegetable waste	12-20	1
Fruit waste	35	1
Grass clippings	12-25	1
Leaves	40-80	1
Stalks	60	1
Straw	75-80	1
Paper	150-200	1
Sawdust	100-500	1
Tree bark	100-130	1
Pine needles	60-110	1
Manure	20	1

Temperature is an important factor in composting because it provides the essential environmental conditions for the development of microorganisms. Microbial activity increases at moderately elevated temperatures, but will decrease if temperatures are too high. The compost should be maintained at temperatures of at least 60°C for two days to destroy seeds and pathogens.

The optimum water content for composting will depend on other factors such as the type of waste and the temperature. However, the likely values will be in the range of 40-50%. Oxygen is essential for compost production because micro-organisms cannot metabolize the substrate and nutrients without it.


Results and conclusions

The type of wastes used in the composting station, are according to the codification of Government Decree No. 856 of August 16, 2002 on waste management records: 20 02 01 - biodegradable waste; 20 01 38 - wood without hazardous substances. In Tables 2 and 3 are presented the characteristics determined in the waste samples - wood material in terms of metal content and the characterization of wood waste.

Table 2. Characteristics of waste samples – wood material in terms of metal content (mg/kg d.m.)

Metal type	UM	Wood material
Al		365.09
Ca		35068.9
Fe		3343.9
K		9358.7
Mg		2670.9
Na		1519.4
Ti		0.07
As	mg/kg d.m.	0.67
Cd		0.11
Cu		66.82
Ni		68.29
Pb		49
Zn		304.3
Hg		0.048
Cr		45.11

Table 3. Characterization of wood waste

Compost sample	W(%)	A(%)	C(%)	N(%)	H(%)	S(%)	Cl(%)	Qs (MJ/kg)	Qi (MJ/kg)
 Wood material	50.1	7.8	48.8	1.23	5.75	0.14	0.27	22.4	21.4

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