

POPULARIZATION OF THE ORGANIC
COMPONENT COMPOSTING
OF HOUSEHOLD WASTE AMONG THE POPULATION

Mariia Korbut¹, Myroslav Malovanyy²,
Kateryna Petrushka², Wojciech Lutek³

¹ Zhytomyr Polytechnic State University,
103, Chudnivska Str., Zhytomyr, 10005, Ukraine
Viacheslav Chornovil Institute of Sustainable Development,

² Lviv Polytechnic National University,
12, S. Bandery Str., Lviv, 79013, Ukraine

³ Faculty of Economics, Maria Curie Skłodowska University,
5, Maria Curie-Skłodowska square, Lublin, 20-031, Poland
korbutmari81@gmail.com

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Abstract. The study, using a survey, found social attitudes towards the separate collection and problematic issues that may hinder its implementation. It was found that most respondents are not familiar with the possibilities of waste composting at home, and residents of multi-storey buildings generally consider composting at home in the kitchen inexpedient. The paper identified the causes of ignorance of the population on household composting conditions. The paper presents the scientific results of the popularization of composting with microbiological additives at home among the population. The study aimed to develop a practical, effective model for the management of the bioorganic component of municipal solid waste, which minimizes the impact of waste on the environment and maximizes resource potential by organizing composting organic waste at home. Based on the research data, recommendations for the population of Zhytomyr on composting household waste have been developed. They explain in detail the mechanism of composting at home and outline the benefits of such composting. The obtained results are practical, they can be used for explanatory work among the population and the development of recommendations on separate waste collecting and composting of the organic part of household waste in domestic conditions.

Keywords: household waste, composting, EM-bokashi, separate waste collection.

1. Introduction

Today, human existence has become environmentally dangerous—primarily due to the formation and accumulation of huge amounts of production and consumption waste. A special place in the composition of municipal waste is occupied by household waste—consumer waste, which has served its term in the household, goods, as well as products unnecessary for a person or their remains (Zakon Ukrainy, 1998). The rate of formation and accumulation of household waste in the world in general and in Ukraine, in particular, creates a danger to the life and health of the population, which necessitates regulation of this area.

The most widespread practice of household waste management in Ukraine is its disposal in landfills and dumps, to which about 95 % of the total amount of generated waste are exposed. The number of landfills and dumps increases annually by 3–6 % (Malovanyy et

al., 2021). The danger of household waste for the environment and humans directly depends on their component composition and placement conditions. Every day, the average Ukrainian produces approximately 1–1.5 kg of waste, where about 40–70 % is food waste or its packaging (Malovanyy et al., 2013; Prykhodko, Hulakhmedova, 2018). One of the simplest and safest methods of food waste disposal is composting. Today, the concept of prevention, minimization of waste generation, recycling and composting is gaining relevance in the world. They promote such models of product and process management which allow reducing the volume

and hazard of waste and materials, preserve and restore resources, and prevent their incineration or disposal. Issues of changing conceptual approaches to waste management and the transition from waste disposal to prevention, reduction of waste generation and the introduction of sorting, processing, use of both material and energy resources waste are key to achieve a positive result in solving waste problems in Ukraine. After signing the Association Agreement with the European Union in 2014, Ukraine made the European choice in state environmental policy, including waste management (Fig. 1).



Fig. 1. Responsible Waste Management Hierarchy

(site <https://waste4change.com/blog/waste4change-supports-3r-reduce-reuse-recycle-green-concept/>)

The problem of inefficient management of household waste and, in particular, its organic component is gaining relevance. One of the most effective ways to solve this problem is composting – a method of producing fertilizers from various organic wastes to obtain environmentally friendly products, improve the soil and reduce the bioorganic share of domestic waste. An important measure to promote composting in households is the organization of a system of separate waste collection and information campaigns among the population (Mishchenko et al., 2013, Getman , Lozo, 2017).

2. Materials and Methods

The purpose of the research is fully consistent with the national task 12.4 “To reduce the amount of waste generation and increase the volume of its recycling and reuse based on innovative technologies and industries” of Sustainable Development Goal 12 “Ensuring the transition to rational models of consumption

and production”. The relevance of the study is also emphasized by the new edition of the Law of Ukraine “On Housing and Communal Services” (Zakon Ukrainy, 2017), which imposes additional obligations not only on companies that provide garbage collection services but also on consumers of their services. Earlier, the legislation considered separate waste collection as only one of the possibilities, now, the Law of Ukraine “On Waste” clearly states that the owners or tenants, users, including renters of sources of household waste, ensure separate collection of household waste. The amount of garbage that residents will take out into containers for separate waste collection (separately for glass, plastic, paper, etc.) will not be taken into account when calculating the payment for the amount of garbage that is removed.

One of the simple and safe methods of food waste disposal is composting, which is quite long-lasting in natural conditions. It is important to find new ways to accelerate the composting process and improve it. One such method is the addition of microbiological additives.

Composting, as a way of dealing with the organic component of waste, is a very promising area of waste disposal and management. Domestic scientists have paid much attention to the study of the course and acceleration of the composting process (Sahdieieva et al., 2018; Sokolova et al., 2019; Biletska, Matiushenko, 2019; Sokolova et al., 2020).

In research, composting is considered as an environmental technology in the process of which waste is destroyed, and the result is compost which can be used as fertilizer to stimulate the restoration of the soil layer. Composting is a natural and safe process for the environment, but it has a number of disadvantages, the main of which are: the duration of the process; the difficulty of maintaining constant conditions throughout the process; unstable quality of the final product, etc. (Sahdieieva et al., 2018; Sokolova et al., 2019; Biletska, Matiushenko, 2019; Sokolova et al., 2020).

All these shortcomings negatively affect the popularity of this method in practice and attract the attention of scientists who explore ways to accelerate the composting process (Biletska, Matiushenko, 2019).

Additional enrichment of the compost mixture of food waste with microbiological additives accelerates the maturation process and enhances the efficiency of the finished compost. Such compost does not contain pathogenic microflora and can be used as fertilizer.

It has a sufficient level of germination index and it is not phytotoxic. The ready-made compost can be used as fertilizer in agriculture when growing crops. Studies show that with increasing the duration of fermentation of the composted mixture, the index of seed germination increases. Colonies of microorganisms in EM preparations accelerate the natural process of composting, taking an active part in the destruction of the components of the plant mixture. The pH values of the finished compost environment are close to neutral indicators (Sokolova et al., 2020).

Despite a significant number of works that highlight various aspects of the problem of household waste composting, scientists often overlook the issue of using microbiological additives to accelerate the composting process and improve the quality of the compost obtained in domestic conditions and popularization of the composting process among the population. The study aimed to develop a practical, effective model for the management of the bioorganic component of household waste, which minimizes the impact of such waste on the environment and maximizes the resource potential by organizing composting organic waste in domestic conditions. One of the objectives of the study to achieve this goal was to create an algorithm for the management

of organic waste in domestic conditions, which can be used for explanatory work among the population.

3. Results and Discussion

As the initial data, we used data on the morphological composition of household waste in some cities of Ukraine, as well as official statistical and environmental information regarding the Zhytomyr region of Ukraine (Malovanyy et al., 2013; Malovanyy et al., 2021).

As part of participation in the urban-cultural event “Workshop of the city of Zhytomyr, 2019” from 6 to 9 June 2019, the authors of the article, representatives of the Department of Ecology of the State University “Zhytomyr Polytechnic” held a seminar discussion, during which the state of the Zhytomyr municipal solid waste landfill and its negative impact on the territory of the city were considered and examples of “civilized” waste management in European countries were given. The participants discussed the possibilities of sorting waste in domestic conditions, the problems that arise during their collection and disposal, the issues that need to be resolved by the authorities for the mass introduction of separate waste collection.

To identify the attitude of respondents to the separate waste collection and problematic issues that may prevent its implementation, after the event, a sociological survey “Perception of the problem of waste disposal by residents of Zhytomyr” was conducted. The questions were devoted to separate waste collection. A total of 98 people were interviewed.

According to the survey, most respondents (64 %) collect garbage separately in their households. However, respondents clarified that they sort only some types of waste (Fig. 2). Among the most sorted waste, the survey participants named glass and paper since it is quite convenient to collect them separately and there are enough collection points for these types of secondary raw materials. In addition, more than half of the respondents separate plastic from the total mass of household waste (if there is a separate container for plastic waste in the local area, the residents usually select and throw away plastic bottles there). Metal is sorted by a small number of residents of Zhytomyr because of its small amount (they consider it impractical to install a separate container in the house to collect metal). The respondents demonstrate a high level of awareness regarding the separate collection of used batteries and accumulators. They know and understand how harmful this waste is and, therefore, they try to take it to specially organized collection points.

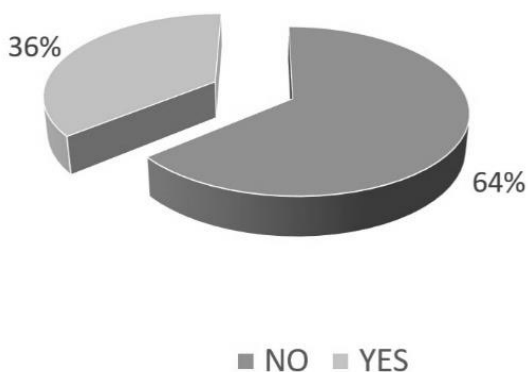


Fig. 2. Separate collection of waste among the population

Residents of the private sector turned out to be the most active in the separate waste collection since they have more free space for installing containers for certain types of waste and use organic waste as fertilizer on their personal plot (40 % of respondents living in private houses compost organic leftovers). However, most respondents were not familiar with the possibilities of composting waste in domestic conditions, which directly depended on the orderliness of the housing stock (74 % of respondents are residents of apartments, and 26 %—of private houses).

The survey revealed that residents of multi-storey buildings are not sufficiently familiar with the methods of composting in domestic conditions and consider composting at home in the kitchen of an apartment to be somewhat “extreme”. To the question, “Do you compost waste?” the answer of 100 % of apartment residents was categorical – “No”.

The situation regarding the knowledge of the methods of composting in domestic conditions was also disappointing: only 12 % were familiar with the term “vermicomposting”, but could not explain what it was; 5 % “heard something” about bokashi composters and 2 people knew what an electric composter was thanks to informative videos from social networks.

After a short explanatory work, the respondents were most interested in composting with EM-bokashi, as this type provides a maximum release of nutrients and accelerate composting (Fig. 3).

Considering the above, based on the analysis of the survey data and identification of problem areas, recommendations were made for the population of the city of Zhytomyr on composting waste in domestic conditions. They explain in detail the mechanism of composting in domestic conditions and outline the benefits of such composting. The recommendations included an algorithm for managing organic waste in

domestic conditions, general characteristics of EM-bokashi, making of EM-compost from kitchen waste, ingredients for creating compost in domestic conditions (what can and cannot be used), examples of containers for composting, explanations on the use of “compost tea” of EM-bokashi as a fertilizer for houseplants, recommendations for the introduction of EM-compost.

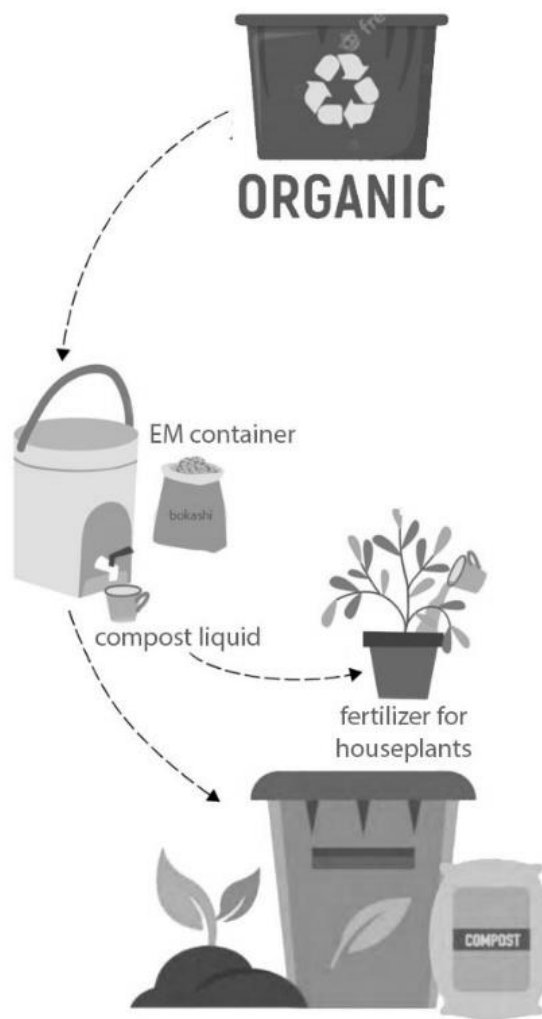


Fig. 3. Visualization of composting with EM-bokashi

As part of the experiment, the recommendations were presented among the guests and participants of the event “Chervone EcoFest”, which took place on June 28, 2019, in the village Chervone of the Zhytomyr region (Davydova et al., 2020). The information found a response among the festival participants. Most respondents (105 people took part in the survey) were impressed by the simplicity and positive aspects of composting at home. Exit-poll data indicate their intentions regarding domestic composting – 92 % decided to start composting with EM-bokashi at home (Fig. 4).

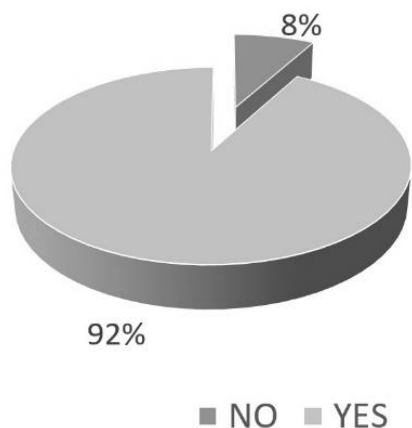


Fig. 4. Exit-poll data on the intentions regarding domestic composting

According to the results of the study, the reason for a lack of education of the population regarding composting in domestic conditions is not insufficient environmental awareness, but, according to the authors, it is much deeper. Firstly, there is a lack of information about the processes that occur with waste when it gets outside the apartment (usually, ordinary citizens are amazed and pondered by the data about the amount of waste generated in their everyday life and what happens next with the waste in landfills). Secondly, people are frightened by the very process of composting waste in domestic conditions because of a lack of a simple algorithm and the unpopularity of the composting process among the population. To date, the process is perceived as something unusual and unnecessary. Thirdly, a lack of incentives and a well-coordinated mechanism of action at the state level (Prykhodko et al., 2019).

4. Conclusions

In the course of the study, an algorithm for the management of organic waste in domestic conditions was developed (based on a survey of the population on awareness of composting and willingness to use it in their homes) and the advantages of using EM-bokashi when composting the organic part of household waste were substantiated.

Composting the bioorganic part of household waste can provide undeniable environmental, social and economic benefits by:

- reduction of the bioorganic share of household waste that ends up in landfills (which, in turn, will not only reduce the area of landfills, but also reduce emissions of landfill biogas which contains 35–70 % of methane),

- obtaining environmentally friendly products, soil improvement by applying the resulting compost,
- savings (since changes in Ukrainian legislation provide for actually free removal of sorted waste).

The obtained results are practical; they can be used for explanatory work among the population and development of recommendations on the relevance of separate waste collection and composting of the organic part of household waste in domestic conditions. The results of the study can be used to optimize the system of management of the bioorganic component of domestic waste in the city of Zhytomyr, which has a number of disadvantages.

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