

A Biological Way to Dispose of Organic Waste and Energy-Saving, Economical and Environmentally Friendly Organic Waste Management

Oleksandr V. BARABASH*¹ and Oksana I. BERDNIKOVA¹

¹Kryzhanovsky Educational Complex of the Limansky district of Odessa, Ukraine

Abstract

The main goal of this article is to develop a model for space heating system (BIORACTOR) that would: be cheaper in operating costs than traditional one; had a source of energy that won't impact the natural environment; be an additional source of hot water for domestic use; be able to solve the problem of burning fallen leaves, branches and organic debris on the ground; be at the end of the heating action would become an organic fertilizer.

Keywords: energy efficiency, waste energy, bioreactor

1 Introduction

The reason of starting this work is fact that in many places in Europe in autumn people rake fallen leaves and burn them - this leads to pollution of air, water and soil, as well as the extinction of certain species of animals. Burning leaves emit carbon monoxide, which blocks the supply of oxygen to body tissues, benzopyrene is released, which can cause cancer of humans. Smoke releases dioxins, poisonous gases, carbon dioxide and nitric oxide into the air, which can cause bronchospasm, allergies, coughs, shortness of breath, can be a source of allergies and affect the immune system. There is also another important problem: the cost of full automatic heating of greenhouses, farms (home mini-farms) and housing and the cost of hot water for domestic use. There are different ways of heating, but not all are harmful to the environment [1, 2, 5–7]. From all of these reasons in this project will be revealed:

- energy-saving method of heating by fermentation of compost from fallen leaves, the residue from the annual rejuvenation of trees in backyards and sawdust from woodworking activities with the addition to the box, the so-called bioreactor, quail manure;
- formation of fertilizer after using this method of heating, however, after some period (approximately 3-4 years);
- the benefit of microgreens compared to adult sprouts;
- the benefit of growing microgreens in a greenhouse heated by a homemade bioreactor.

In this way it will be shown how to save money and save natural resources and get quality organic fertilizer and open the topic of the benefits of eating microgreens in food. The project has started in September 2018 and will take 2-3 years, until the results will be obtained from the processing of sawdust and fallen leaves on.

2 Research methods

At the beginning of the project there was measured amount of energy used for space heating system in traditional model for selected house. Then, there was built a bioreactor shown in Figure 1 and the measurement was done again. Bioreactor was 1.2 x 1.2 x 1.0 m size.

The compost bioreactor is able to heat water up even to 70°C [4].

*corresponding author: E-mail address: leto300776@gmail.com (Oleksandr V. BARABASH)



Figure 1. Bioreactor construction [3]

3 Results

In table 1 and in figure 2 there was shows how was changed the amount of money needed for space heating in selected house within two years.

Table 1. Cost indicators before and after the installation of the bioreactor

| | summer (costs) UAH | autumn (costs) UAH | winter (costs) UAH | spring (costs) UAH |
|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| before installation (2018) | 630 | 2050 | 6210 | 2070 |
| after installation (2019) | 340 | 1010 | 4680 | 1050 |

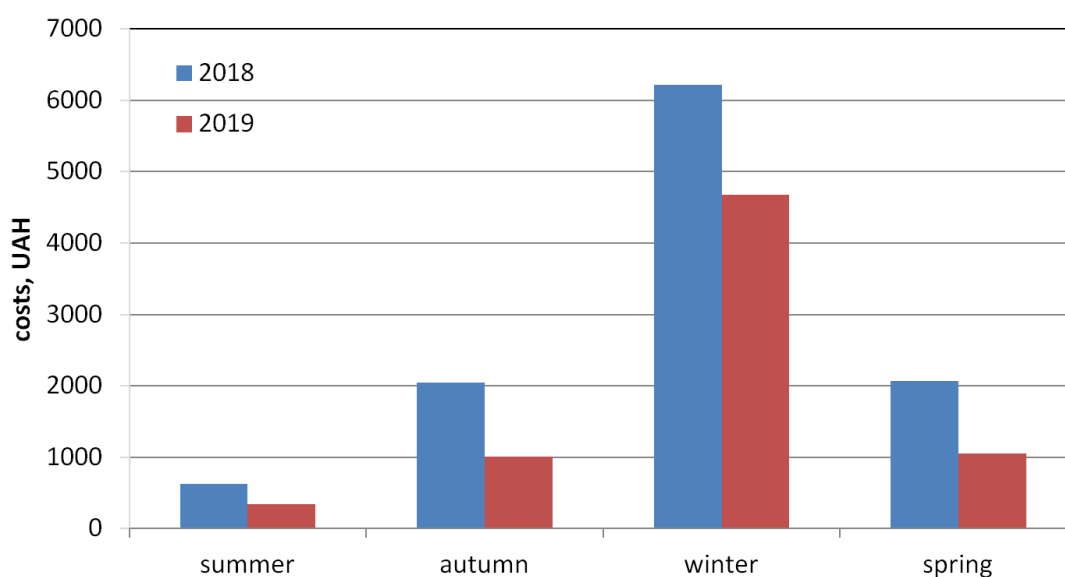


Figure 2. Indicators of family budget savings and comparison of the year before the use of the bioreactor and the year with the use of the reactor.

As the graph shows, the energy consumption and thus the heating costs were lower in all seasons of the year thanks to the bioreactor heating. in the heating season of 2018, the costs amounted to UAH 10,960, while in the heating

season of 2019 it was only UAH 7,080.

4 Conclusion

Main results of project can be described as:

- composting is useful and necessary for improving energy efficiency of heating system;
- when creating and using a bioreactor, it is possible to obtain hot water for space heating and / or for domestic use, without additional impact on the environment and quality organic fertilizer;
- experimental studies have shown that it is possible to reduce energy consumption by 35 % by using a bioreactor;
- microgreens accumulate a concentrate of trace elements, proteins and vitamins that people needs for existings.

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