RESEARCHERID
THOMSON REUTERS

[Bratovcic* *et al.*, 7(6): June, 2018]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

EFFICIENCY OF FOOD WASTE AS AN ORGANIC FERTILIZER

Amra Bratovcic,[1] Mirnesa Zohorovic,[2] Amra Odobasic,[3] Indira Sestan[4]

[1,3,4] Department of Physical Chemistry and Electrochemistry, University of Tuzla, Faculty of Technology, Bosnia and Herzegovina

[2] Department of Environmental Protection, University of Tuzla, Faculty of Technology, Bosnia and Herzegovina

DOI: 10.5281/zenodo.1299043

ABSTRACT

The challenge of many researchers today is sustainable development. So when we talk about food waste management, there are several ways to apply it. One of them is the production of compost fertilizers by home composting as the most sustainable option for managing organic food waste by natural decomposition process at atmospheric pressure and at room temperature. The physical parameters were tested for pH value and the chemical parameters such as organic matter, Nitrogen, Phosphorus and Potassium. In this work we have investigated 2 different samples under the name goat manure fertilizer and organic compost. We wanted to compare the quality of those different fertilizers. The experimental results showed that the organic fertilizer contain 1,5 times higher concentration of Phosphorus, comparable concentration of Nitrogen and 1,5 times lower concentration of Potassium than goat manure fertilizer.

KEYWORDS: food waste, organic fertilizer, goat manure fertilizer, N, P, K.

I. INTRODUCTION

Food waste refers to all unconsumed food substances that are disposed of or recycled. Food waste is generated from households, markets, hawker centres, supermarkets and food courts or other eating establishments [1]. These wastes must be removed to provide a clean and healthy environment. These can be achieved through the use of composting to manage the waste and to produce compost that can be used in field crop production. Food waste has high energy content and it seems ideal to achieve dual benefits of energy production and waste stabilization [2]. More than a third of total waste generated in households is organic or bio-waste. Lost organic matter directly impoverishes land, degrades agricultural land, cuts forest, draws up accumulated carbon deposits (oil, gas), creates social inequality in the countries where these products come from, encourages climate change and so on.

Composting is an easy, economical and natural biodegradation process that takes organic waste usually food waste and turns into nutrient rich food for plants. Composting is a biochemical process converting various components in organic waste into relatively stable humus-like substances that can be used as a soil amendment or organic fertilizer [3]. The classic way of composting is less frequent and is mostly carried out in households. Waste management implies proper disposal of waste in a way that does not endanger human health and the environment. Newer US studies have proven that 90% of the population believes recycling is very important for environmental protection. Composting is a natural process of degradation of biomass and is happening all around us. By composting, we reduce the amount of waste for disposal and disposal, and by compost we return the nutrients to the soil from which they flow, where they will gradually turn into humus - fertile soil.

Composting is one of the low cost biological decomposition process. The composting process is circuited by microbial activity. The physical - chemical parameters affected by this process include temperature, aeration, and moisture content, C: N ratio and pH [4]. Collected remains of plants are not waste but are high-value raw materials for compost production. All plant waste from the kitchen, garden, orchard and lawn can be composted. High quality compost will be obtained if we mix well as different and chopped plant material.

The ideal proportion of composting materials is the use of all materials in the ratio of 50% bio-rich in carbon and 50% nitrogen-rich biotope. By composting we establish a natural circular stream of matter in nature. If

composting is badly managed then from compost batches come these unpleasant smell caused by anaerobic decomposition (landfill gases usually contain methane, methanethiol, ammonia and so on).
Goat manure fertilizer is high in organic materials and rich in nutrients. It is an excellent natural fertilizer containing nitrogen, phosphorus, potassium and other nutrients.

II. MATERIALS AND METHODS

Experimental part

This paper presents the results of composting in the garden with the previously separate collection of bio-waste into separate tanks and waste to the composting site. The composting site was located in the part of the garden, which is in the lower half, under the tree, because the crust protects the compost from excessive drying in the heat and excessive moistening in the rainy season.

Material and methods

Preparation of compost pile

The material that was composted was cut to a length of not more than 5 cm to allow microorganisms, fungi and desirable bacteria to have access to carbon that needs to be processed. The composting material consisted of domestic household waste consisting of egg shells, salad leaves, peel and fruit and vegetable residues, sawdust, fewer amounts of paper and worms. To ensure airborne composting, we placed unmounted twigs at the bottom of the composting bin and one layer of twigs on the middle of the compost, thereby providing an empty space at the bottom and center of the oxygen flow. Microorganisms that break down bio-waste for their work are oxygen, and by degradation of bio-waste releases carbon dioxide and heat that is rapidly occurring in composters, and if there is a shortage of oxygen, classical degradation stops and other types of microorganisms are present - those working in the environment without oxygen - and you are undesirable for unpleasant smells.
At figure 1 is shown the appearance of the plastic compost pile.

Figure 1

The appearance of the plastic compost pile.

The Kjeldahl method has been used for the determination of total Nitrogen. Phosphorus is determined by modified Ammonium molybdate spectrometric method ISO standard ISO 6878: 2006 method. For each sample has been taken about 1 g of soil and placed for the digestion with 4,5 M H_2SO_4 and $K_2S_2O_8$. After digestion the samples were filtered, added reagents and then measured absorbance. The Potassium has been determined by Flame photometer Jenway with propane gas.

III. RESULTS AND DISCUSSION

For the determination of organic matter was used the method of annealing at a temperature of 500-600°C. 3-5 g of cleaned soil sample from the rest of the root was transferred to the crucible which was previously weighed. A sample with the crucible was transferred to an annealing furnace and slowly heated to a temperature of 500-600 ° C for 3 hours where a combustion of organic matter occurred.
For the determination of nitrogen and phosphour, were used the same procedure like in previously published paper of authores Amra Bratovcic et al. [5]. The results of all experiments are shown in table 1.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Table 1. pH values and % of organic matter

Sample	pH	% Organic matter
1 - goat manure fertilizer	7,12	89,89
2 – organic compost	6,37	91,07

The results in table 1 shows that organic compost has a little bit lower pH value but still remain neutral, like goat manure fertilizer. In the context of organic matter, we can see that both samples are very rich in organic matter.

In diagram 1 are showed determined pH values.

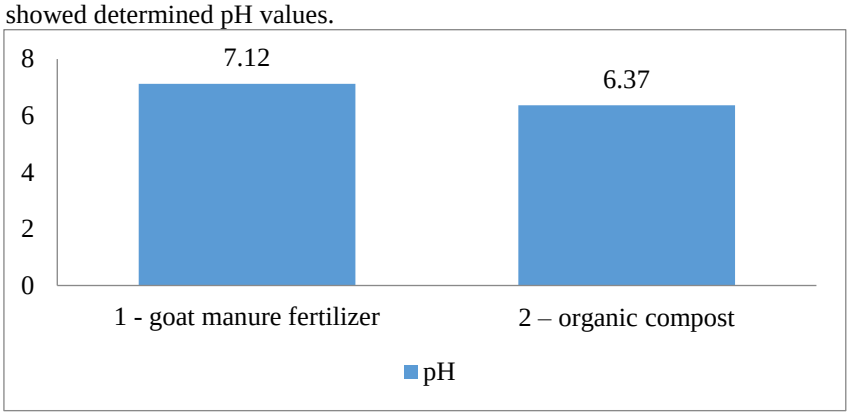

Diagram 1. Determined pH values in goat manure fertilizer and in organic compost generated from food waste

Table 2. Percent of total nitrogen, phosphorus and potassium in goat manure fertilizer and in organic compost generated from food waste

Sample	% Total N	% Total P	% K
1 - goat manure fertilizer	0,216	1,68	3,8
2 – organic compost	0,228	2,53	2,4

In diagram 2 are showed determined % of organic matter.

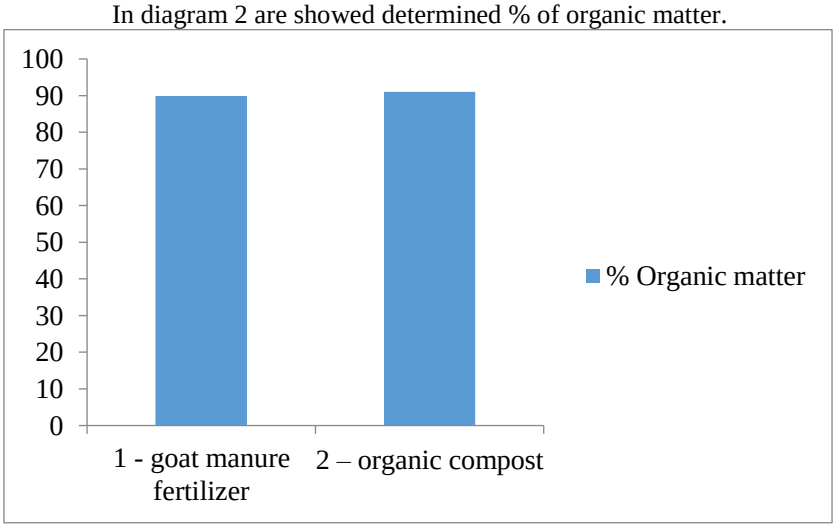

Diagram 2. Percent of organic matter in goat manure fertilizer and in organic compost generated from food waste

In diagram 3 are shown determined concentrations of nitrogen, phosphorus and potassium in goat manure fertilizer and in organic compost generated from food waste.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

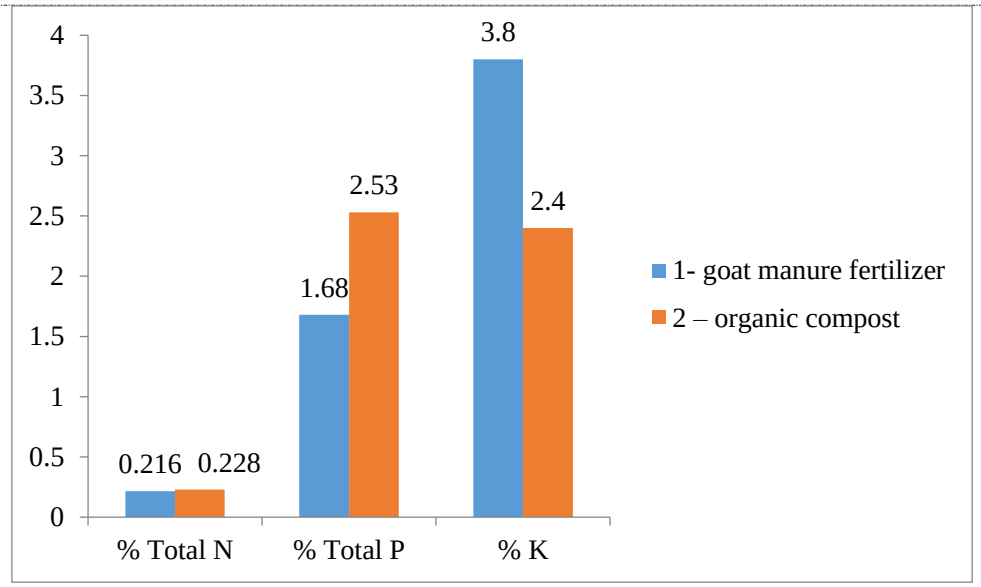

Diagram 3. Concentrations of nitrogen, phosphorus and potassium in goat manure fertilizer and in organic compost generated from food waste

IV. CONCLUSION

Generating of healthy soil is necessary to grow healthy food. Composting is definitely an important and necessary method of waste management. This study shows that composting process is one of the alternative ways to reduce food waste generation at household. Our experimental data show that the concentration of total phosphorus is 1,5 times higher in an organic compost generated from food waste than in goat manure fertilizer. On the other side we can see 1,5 times higher concentration of potassium in a goat manure fertilizer than in a organic compost. And we can see comparable concentration of nitrogen in both samples. Considering that pH value is neutral for both samples and the level of organic matter is about 90% in both cases we can confirm very high quality of both fertilizers. Composting is one of the alternative ways to treat organic waste that is more environmentally friendly. In addition composting can improve soil structure and soil fertility.

REFERENCES

[1] Love your food, A Handy Guide to reducing food wastage and saving money, National Environment Agency 2017, https://www.cgs.sg/docs/default-source/Resources/nea-a4-toolkit_digital_(updated-on-21mar17)_fa.pdf
[2] Oladapo T. Okareh et al., Journal of Research in Environmental Science and Toxicology (ISSN: 2315-5698) Vol. 3(4) pp.066-072, 2014 Available online http://www.interesjournals.org/JREST, DOI: http:/dx.doi.org/10.14303/jrest.2012.031
[3] A A Kadir *et al* 2016 *IOP Conf. Ser.: Mater. Sci. En* Materials Science and Engineering 136 (2016) 012057, doi:10.1088/1757-899X/136/1/012057
[4] Suhas S. Gonawala and Hemali Jardosh, *International Journal of Current Engineering and Technology*, Vol.8, No.1 (Jan/Feb 2018), E-ISSN 2277 –4106, P-ISSN 2347 –5161
[5] Amra Bratovcic et al., Investigation of Compost Quality of Meadow Grass, *International Journal of Advances in Agricultural Science and Technology*,Vol.4 Issue.10, October-2017, pg. 18-27*(15)*