

Changing spent mushroom substrate into a quality vermicompost

Supawadee Ruangjanda ^a and Chuleemas Boonthai IWAI ^{ab*}

^a Soil Science and Environment, Faculty of Agriculture, Khon Kaen University, Khon Kaen, 40002, Thailand

^b Integrated Water Resource Management Research and Development Center in Northeast Thailand, Khon Kaen University, Thailand

*Corresponding email: chuleemas1@gmail.com



Abstract

Safety food and healthy food gain widespread popularity nowadays. Therefore consumption of mushrooms is increasing. Mushrooms are a healthy food because they have high protein and important substances that are effective in stimulating various immune system functions. It could cause a large amount of waste from cultivation of mushrooms become a waste problem. Therefore, The aim of this study was study to using spent mushroom substrate to increase nutrients quality in vermicompost. The study was conducted by using *Eudrilus eugeniae* cultured under six different ratio of bedding with spent mushroom substrate (100:0, 80:20, 60:40, 50:50, 40:60, 20:80). The result found that the highest growth rate of earthworms (2.5%) in bedding with spent mushroom substrate at the ratio 60:40. The value of pH, EC, OC and C/N ratio was significantly decreased. And the highest decreasing at the ratio 60:40. On the other hand, The increasing nutrient content (Total N, P, K, Mg, Ca) in this ratio. Therefore, Application of bedding with spent mushroom substrate at the ratio of 60:40 was suitable for produce vermicompost. To be able to reduced spent mushroom substrate that will affect the environment. It increases the amount of nutrients needed for plants, produced organic fertilizers that had a better chemical and biological properties quality. And can be applied to development of agricultural products.

Materials and Methods



Results

Introduction

Thailand has the potential to produce mushrooms in the industrial sector with favorable factors, including weather conditions. Technical expertise, variety of materials and a lot market as a result of continuous research and development of production models, various types of mushrooms can be produced. Can be in large quantities with low production costs to support the market demand that tends to increase both domestic and foreign markets. Moreover, Safety food and healthy food gain widespread popularity nowadays. Therefore consumption of mushrooms is increasing. Mushrooms are a healthy food because they have high protein and important substances that are effective in stimulating various immune system functions. It could cause a large amount of waste from cultivation of mushrooms become a waste problem.



Objective

1. To study using spent mushroom substrate to increase nutrients quality in vermicompost.

- 1.1 To study the growth rate of earthworm cultured under different ratio of bedding with spent mushroom substrate
- 1.2 To study the chemical properties of *Eudrilus eugeniae* vermicompost cultured under different ratio of bedding with spent mushroom substrate

Acknowledgement

This research was completely supported Department of Soil Science and Environment, Faculty of agriculture, Khon Kaen University, Research Fund for Supporting Lecturer to Admit High Potential Student to Study and Research on His Expert Program Year 2019, Japanese Chamber of Commerce, Bangkok Scholarship 2019 and Integrated Water Resource Management Research and Development Center in Northeast Thailand.

Reference

- Edwards, C.A. and Burrows, I. 1988. The potential of earthworms composts as plant growth media. p 211-219. In: Edwards, C.A. and Newhouse, E.F. (eds.). Earthworms in waste and environmental management. SPB Academic Publishing, The Hague.
- Gong, X., S. Li, M.A. Carson, S.X. Chang, Q. Wu, L. Wang, Z. An, and X. Sun. 2019. Spent mushroom substrate and cattle manure amendments enhance the transformation of garden waste into vermicomposts using the earthworm *Eisenia fetida*. Environmental Management. 248.

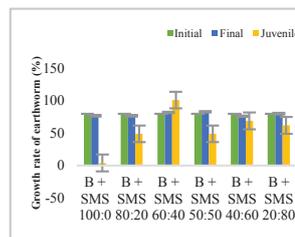


Figure 1 The growth rate of earthworm at the beginning and the end of the vermicomposting process by using *Eudrilus eugeniae* in different ratio for 45 days.

Table 1 Initial physicochemical characterization of the bedding (soil, cow dung, rice husk ash, vegetable waste) and spent mushroom substrate (SMS) used in the vermicomposting process.

Treatment	Soil	Cow dung	Rice husk ash	Vegetable waste	Spent mushroom substrate
pH (1-10)	5.29 ± 0.01	9.01 ± 0.01	9.60 ± 0.00	5.39 ± 0.04	7.45 ± 0.02
EC (dSm ⁻¹)	0.070 ± 0.01	1.557 ± 0.05	1.200 ± 0.03	0.926 ± 0.01	1.259 ± 0.04
Organic carbon (%)	0.43 ± 0.00	16.65 ± 0.37	1.35 ± 0.20	40.19 ± 0.09	38.52 ± 0.63
Total nitrogen (%)	0.01 ± 0.00	0.31 ± 0.01	0.02 ± 0.01	0.99 ± 0.04	0.32 ± 0.02
Total phosphorus (%)	0.04 ± 0.00	0.44 ± 0.01	0.19 ± 0.00	0.28 ± 0.01	0.09 ± 0.00
Total potassium (%)	0.01 ± 0.00	2.36 ± 0.02	0.19 ± 0.00	4.58 ± 0.16	3.08 ± 0.09
Magnesium (%)	0.00 ± 0.00	0.37 ± 0.01	0.07 ± 0.00	0.17 ± 0.00	0.27 ± 0.00
Calcium (%)	0.00 ± 0.00	0.21 ± 0.01	0.02 ± 0.00	1.20 ± 0.01	1.10 ± 0.08
C/N ratio (%)	43.00 ± 9.40	53.71 ± 1.20	67.50 ± 27.74	40.60 ± 1.37	120.38 ± 9.15

B, Bedding (soil: cattle manure: husk: vegetable, 4:3:2:1); SMS, spent mushroom substrate.

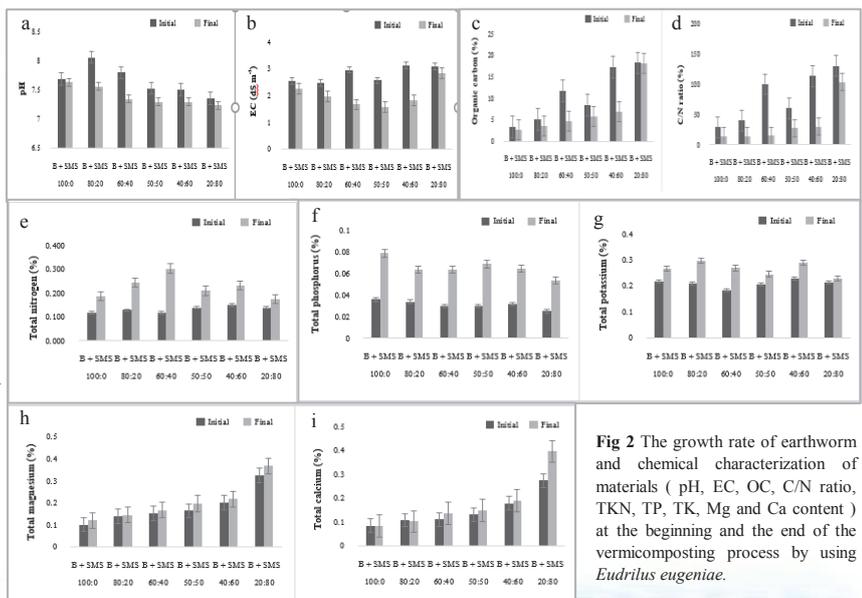


Figure 2 The growth rate of earthworm and chemical characterization of materials (pH, EC, OC, C/N ratio, TKN, TP, TK, Mg and Ca content) at the beginning and the end of the vermicomposting process by using *Eudrilus eugeniae*.

Conclusion

Application of bedding with spent mushroom substrate at the ratio of 60:40 was suitable for produce vermicompost. To be able to reduced spent mushroom substrate that will affect the environment. It increases the amount of nutrients needed for plants, produced organic fertilizers that had a better chemical and biological properties quality. And can be applied to development of agricultural products.