COMPOSTABILITY AND VERMICOMPOSTABILITY OF GREASEPROOF WRAPPING PAPER

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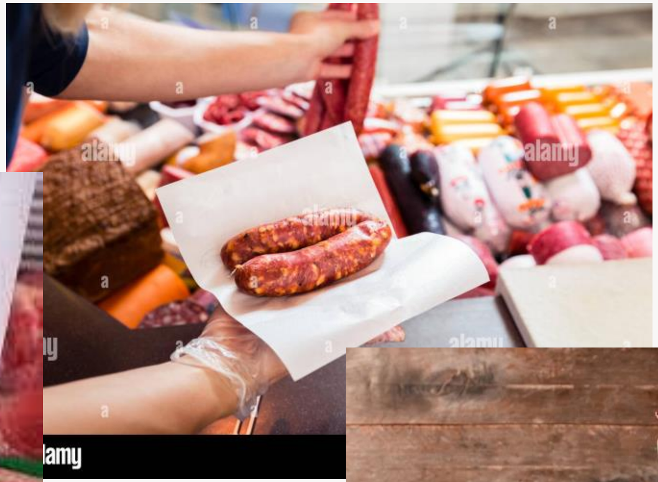
INTRODUCTION

- Greaseproof paper is ideal packaging materials for food containing fat and water.



- The paper is specially treated to prevent penetration of fat and moisture into the paper structure and through it, thus preserving the packaged food as well as the packaging and its printing in perfect condition.

INTRODUCTION

- The oils and fats from the foods makes the recyclability of the used greaseproof paper on new paper impossible.

- In most cases, greaseproof paper is part of mixed municipal waste, which ends up in the landfill or, in better case, in a waste-to-energy plant.

Or

INTRODUCTION

- Composting and vermicomposting of greaseproof wrapping paper?

OBJECTIVES

- The aim of this work was to determine the degree of compostability and vermicompostability of greaseproof wrapping paper and evaluate the resulting product according to legislative requirements.
- The novelty is the testing of the biological processing of used greaseproof wrapping paper, which is not suitable for conventional material recycling into new paper. However, it could be used to prepare quality organic fertilizer.
- The results of this research are important and useful for producers, users and downstream processors of this type of waste.

MATERIAL AND METHODS

- Greaseproof wrapping paper was provided by KRPA PAPER, a.s., Czech Republic.
- The paper was cut into narrow strips using a shredder and soaked for 18 hours in excess of water, which was then drained from the barrel.
- The addition of apple pomace and horse manure was used.
- The input substrate for the electric composter came from Dekos R, Ltd.

	Paper (wet)	Apple pomace	Horse manure	Input substrate
Dry matter (%)	45.7 ± 0.06	34.9 ± 0.87	25.2 ± 0.86	96.4 ± 0.15
pH/H_2O	6.8 ± 0.04	3.2 ± 0.03	7.4 ± 0.06	4.4 ± 0.09
EC (µS/cm)	80.3 ±13.6	1 103 ± 199.7	554 ± 32.7	9 423 ± 371.7
C:N rate	1 050 ±74.4	48.7 ± 6.01	15.8 ± 1.83	18.4 ± 1.19
Ctot (%)	42.3 ± 0.10	45.6 ± 0.31	18.4 ± 0.81	46 ± 1.6
Ntot (%)	0.01 ± 0.001	0.1 ± 0.01	1.3 ± 0.11	1.6 ± 0.21

Values are means ± SD (n=3)

MATERIAL AND METHODS

Two types of experiments:

- I. Composting in GreenGood electric composter
  - Three composting variants were prepared:
    - substrate 50% vol. + paper 50% vol. (variant I; PAP)
    - substrate 50% vol. + paper 25% vol. + apple pomace 25% vol. (variant II; AP)
    - substrate 50% vol. + paper 25% vol. + horse manure 25% vol. (variant III; HM)
- Variants were inserted in sequence into the composter and monitored.
- Every 1, 12, 24, 48 and 120 hours, samples were taken up for determination of disintegration.

MATERIAL AND METHODS

- II. Vermicomposting in Worm Factory vermicomposters
  - Three variants were prepared:
    - paper 100% vol. (vermicompost I; PAP)
    - paper 50% vol. + apple pomace 50% vol. (vermicompo)
    - paper 50% vol. + horse manure 50% vol. (vermicompost III; HM)
- There were always two layers in these vermicomposters.
- In the first bottom layer was an earthworm substrate (50 pcs/L)
- The experiment run for 4 months. Every month a sample was taken to determine the disintegration of vermicomposted paper, the number and biomass of earthworms.
- Earthworms in vermicomposters were no longer fed, only moisture was regulated. At the end of the experiment, 3 samples were taken up from each vermicomposter, only from the upper layers.
- From both types of experiments these parameters were measured:
- The disintegration using three sieves with mesh sizes of 9 mm, 5 mm and 2 mm, dry matter, pH, EC, C, N, P, K, Mg, risk elements, DOC, NH_4^+, NO_3^-, available nutrients, phytotoxicity test, the number and biomass of earthworms.

RESULTS AND DISCUSSION

Disintegration (%) in variant I during composting in electric composter.

	variant I (substrate + paper)				
Wet sample	1st hour	12th hour	24th hour	48th hour	120th hour
mesh 9 mm	49.7 ± 0.58[a]	53.3 ± 2.08[a]	63.7 ± 1.15[a]	69 ± 1.7[a]	70 ± 1.0[a]
mesh 5 mm	50.0 ± 1.0[a]	52.3 ± 1.53[a]	60.7 ± 0.58[a]	66.3 ± 2.31[a]	68 ± 2.6[a]
mesh 2 mm	48.3 ± 2.31[a]	50 ± 1.0[a]	55.7 ± 2.08[a]	58 ± 1.0[a]	62.3 ± 1.53[a]

Disintegration (%) in variant I during vermicomposting.

vermicomposter I (PAP)				
Wet sample	1st month	2nd month	3rd month	4th month
mesh 9 mm	0[a]	0[a]	6.7 ± 1.53[a]	10 ± 1.0[a]
mesh 5 mm	0[a]	0[a]	0[a]	0[a]
mesh 2 mm	0[a]	0[a]	0[a]	0[a]

Values are means, ± standard deviation (n = 3). The indices show statistically significant differences according to the relative frequency test ($u \geq u\alpha$).

RESULTS AND DISCUSSION

Disintegration (%) in variant II during composting in electric composter.

	Variant II (substrate + apple pomace + paper)				
Wet sample	1st hour	12th hour	24th hour	48th hour	120th hour
mesh 9 mm	74.7 ± 0.58[a]	77.7 ± 0.58[a]	**88.3 ± 0.58[b]**	**95.7 ± 0.58[b]**	**99.3 ± 1.15[b]**
mesh 5 mm	53.7 ± 1.53[a]	54.3 ± 2.08[a]	75.3 ± 0.58[a]	**93.3 ± 1.53[b]**	**97 ± 1.0[b]**
mesh 2 mm	44.7 ± 0.58[a]	51.7 ± 1.53[a]	71 ± 2.65[a]	84 ± 1.7[a]	**94.7 ± 1.58[b]**

Disintegration (%) in variant II during vermicomposting.

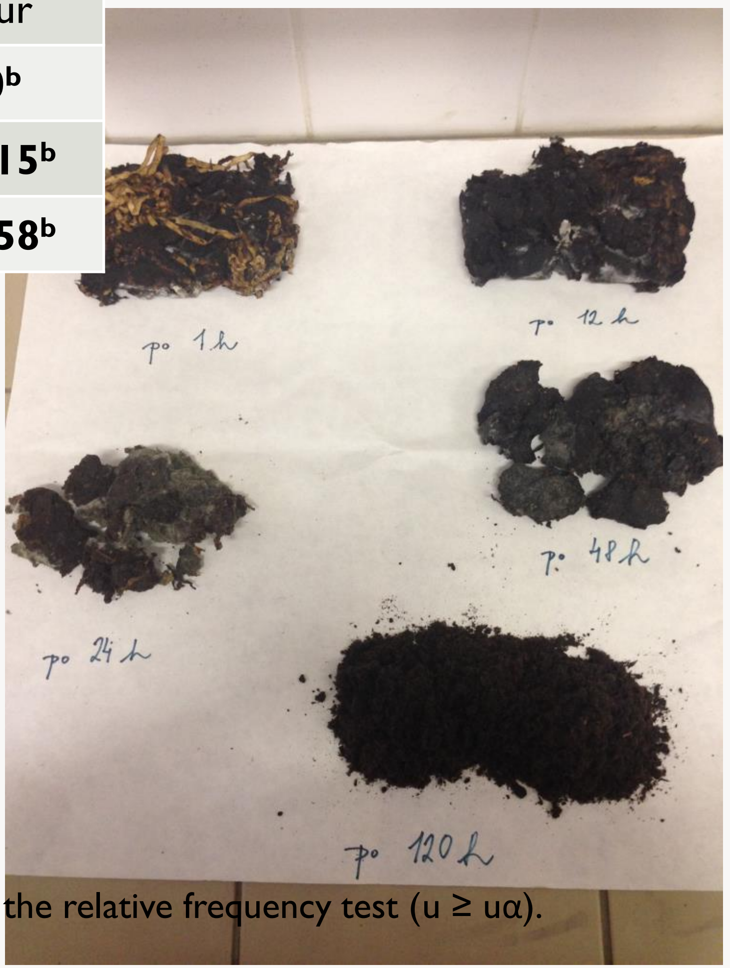
vermicomposter II (AP)				
Wet sample	1st month	2nd month	3rd month	4th month
mesh 9 mm	43 ± 1.0[a]	46.3 ± 1.53[a]	**91.7 ± 3.51[b]**	**97.3 ± 0.58[b]**
mesh 5 mm	29.3 ± 1.53[a]	40.7 ± 0.58[a]	**84.7 ± 1.53[b]**	**94.3 ± 0.58[b]**
mesh 2 mm	11.3 ± 3.06[a]	24.7 ± 5.51[a]	80 ± 1.0[a]	**91.7 ± 1.53[b]**

Values are means, ± standard deviation (n = 3). The indices show statistically significant differences according to the relative frequency test ($u \geq u\alpha$).

RESULTS AND DISCUSSION

Disintegration (%) in variant III during composting in electric composter.

	variant III (substrate + horse manure + paper)				
Wet sample	1st hour	12th hour	24th hour	48th hour	120th hour
mesh 9 mm	74.7 ± 0.58^{a}	78.7 ± 0.58^{a}	87 ± 2.0^{b}	**92.7 ± 0.58^{b}**	**100 ± 0^{b}**
mesh 5 mm	63.3 ± 4.16^{a}	69.7 ± 2.08^{a}	79.7 ± 0.58^{a}	**91 ± 1.0^{b}**	**99.3 ± 1.15^{b}**
mesh 2 mm	48 ± 3.0^{a}	47.3 ± 0.58^{a}	60.3 ± 1.53^{a}	**84.7 ± 1.53^{b}**	**97.7 ± 0.58^{b}**



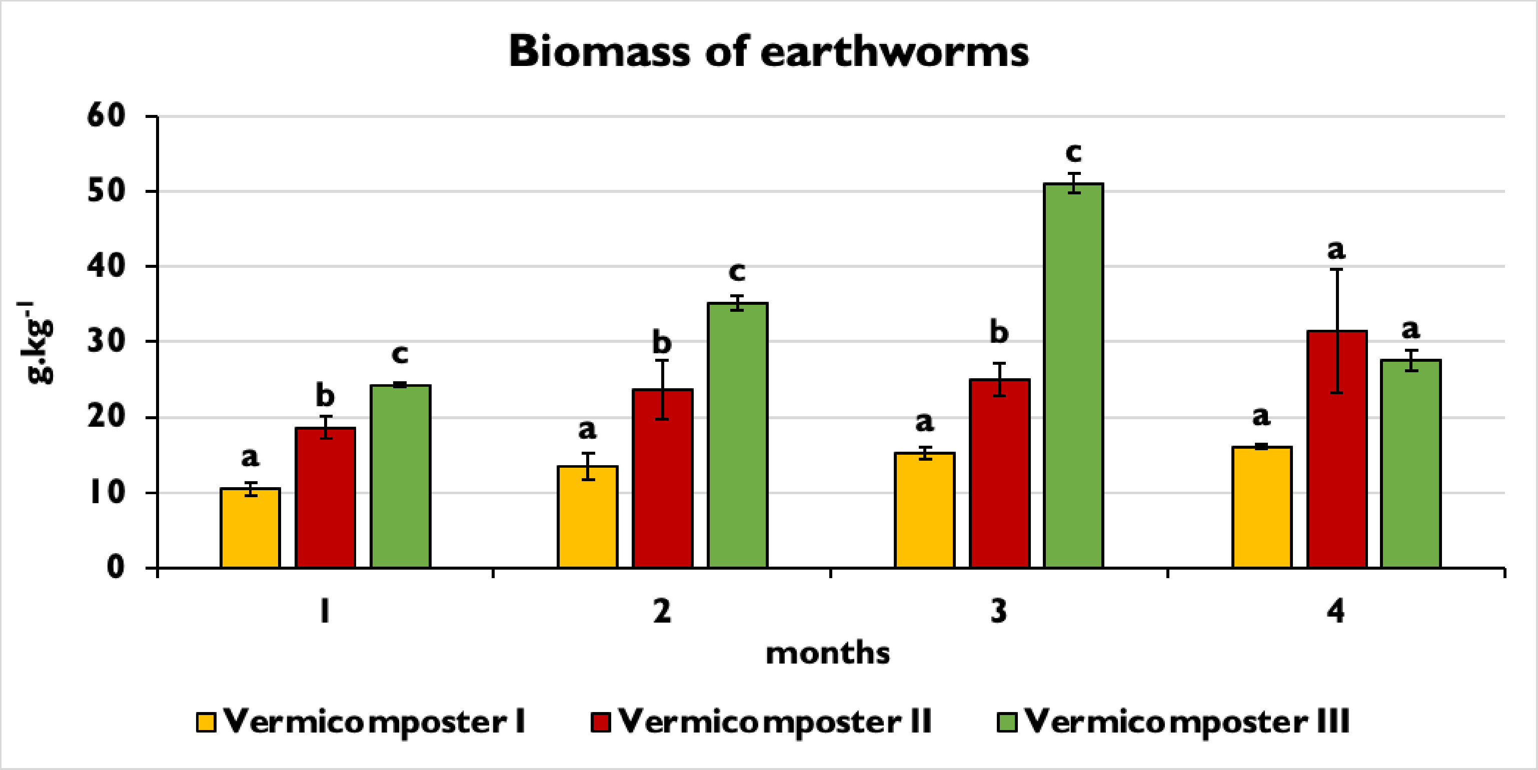
Disintegration (%) in variant III during vermicomposting.

vermicomposter III (HM)				
Wet sample	1st month	2nd month	3rd month	4th month
mesh 9 mm	77 ± 2.6^{a}	**100 ± 0^{b}**	**100 ± 0^{b}**	**100 ± 0^{b}**
mesh 5 mm	65.3 ± 2.52^{a}	**100 ± 0^{b}**	**100 ± 0^{b}**	**100 ± 0^{b}**
mesh 2 mm	51.3 ± 1.53^{a}	**85 ± 1.0^{b}**	**94.7 ± 2.52^{b}**	**95.3 ± 0.58^{b}**

Values are means, ± standard deviation (n = 3). The indices show statistically significant differences according to the relative frequency test ($u \geq u\alpha$).

RESULTS AND DISCUSSION

Earthworm biomass in all vermicomposter variants within 4 months.



Values are means, ± standard deviation (n = 3). The indices show statistically significant differences according to Tukey's test at month 1 to month 3 and Kruskall-Wallis test at month 4 (P ≤ 0,05).

CONCLUSION

- In terms of faster waste paper reduction, composting in the GreenGood composter with the addition of organic waste was more efficient than vermicomposting.
- This compost was not suitable for fertilization, due to the acidic pH and the extremely high electrical conductivity, unlike vermicomposts based on paper with apple pomace or manure.
- Vermicomposting took much longer time than composting at GreenGood, but the resulting vermicompost based on paper and manure appeared to be the most suitable for fertilization.

THANK YOU FOR YOUR ATTENTION!

Acknowledgment

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