

Low-thermal pre-treatment of organic fraction of municipal solid waste – effect of solubilization

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WHAT IS FOOD WASTE?

Food waste (FW) - food that was not used for its intended purpose and include:

- unsold food from retail stores;
- plate waste,
- uneaten prepared food,
- kitchen trimmings from restaurants, cafeterias, and households;
- by-products from food and beverage processing facilities.



WHAT IS FOOD WASTE ?

Food waste – converting into valuable products such a biopolymers or and medium chain fatty acids during open culture fermentation proces (OCF), according to zero-waste concept for the valorization of unwanted materials.

Limitation of OCF process – hydrolysis (first step)

Need to modify structure of food waste and initiale hydrolysis



THERMAL PRE-TREATMENT

- low-thermal pre-treatment (<100°C, usually from 40 to 90°C)
- aerobic condition (in order to avoid biogas production)
- mixing of substrate (in order to distribution oxygen and heating energy)







AIM OF THE WORK

The aim of the work was investigation of LT-PT of organic fraction municipal solid waste for enhancing biomass degradation.





ARTIFICIAL FOOD WASTE COMPOSITION

AFW component	%	[kg]
bread	5,00	1,500
rice	5,00	1,500
pasta	5,00	1,500
potatoes	22,00	6,600
carrot	12,00	3,600
cabbage	7,00	2,100
tomatoes	10,00	3,000
apples	20,00	6,000
banana	5,50	1,650
lemon	5,50	1,650
coffee waste	0,25	0,075
tea waste	0,25	0,075
paper towels	1,50	0,450
grass	0,50	0,150
leaves	0,50	0,150





ARTIFICIAL FOOD WASTE PREPARATION





MATERIALS AND METHODS

LOW-THERMAL PRE-PREATMENT (LT-PT)

Experimental condition:

- temperature: 45°C /50°C /55°C
- duration time: 0h/24h/48h/72h
- mixing frequency: 30Hz
- O₂ concentration: >0,2 mg/L



low termal pre-treatment reactors – laboratory scale



MATERIALS AND METHODS

AFW SAMPLE ANALYSIS





sCOD concentrations



sCOD percentage increase



VFAs concentrations



VFAs percentage increase



VFAs concentrations

VFAs concentrations after LTD at 45°C



VFAs concentrations after LTD at 50°C



VFAs concentrations





LT-PT is a promising method used for AFW for enhancing biomass degradation

optimal condition of LT-PT of AFW: temperature 55°C, duration time 48h)

presented technology will be adopted to technological scale

future research – testing co-substrates using presented technology LT-PT

future research – testing LT-PT combined with enzymatic hydrolysis





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WasteValue overview



Anaerobic biorefinery for resource recovery from waste feedstock





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HISTORY IS WISDOM FUTURE IS CHALLENGE



THANK YOU FOR YOUR ATTENTION