IMPROVING MUNICIPAL ORGANIC WASTE TREATMENT THROUGH THERMAL HYDROLYSIS TO ENHANCE ANAEROBIC DIGESTION PERFORMANCE

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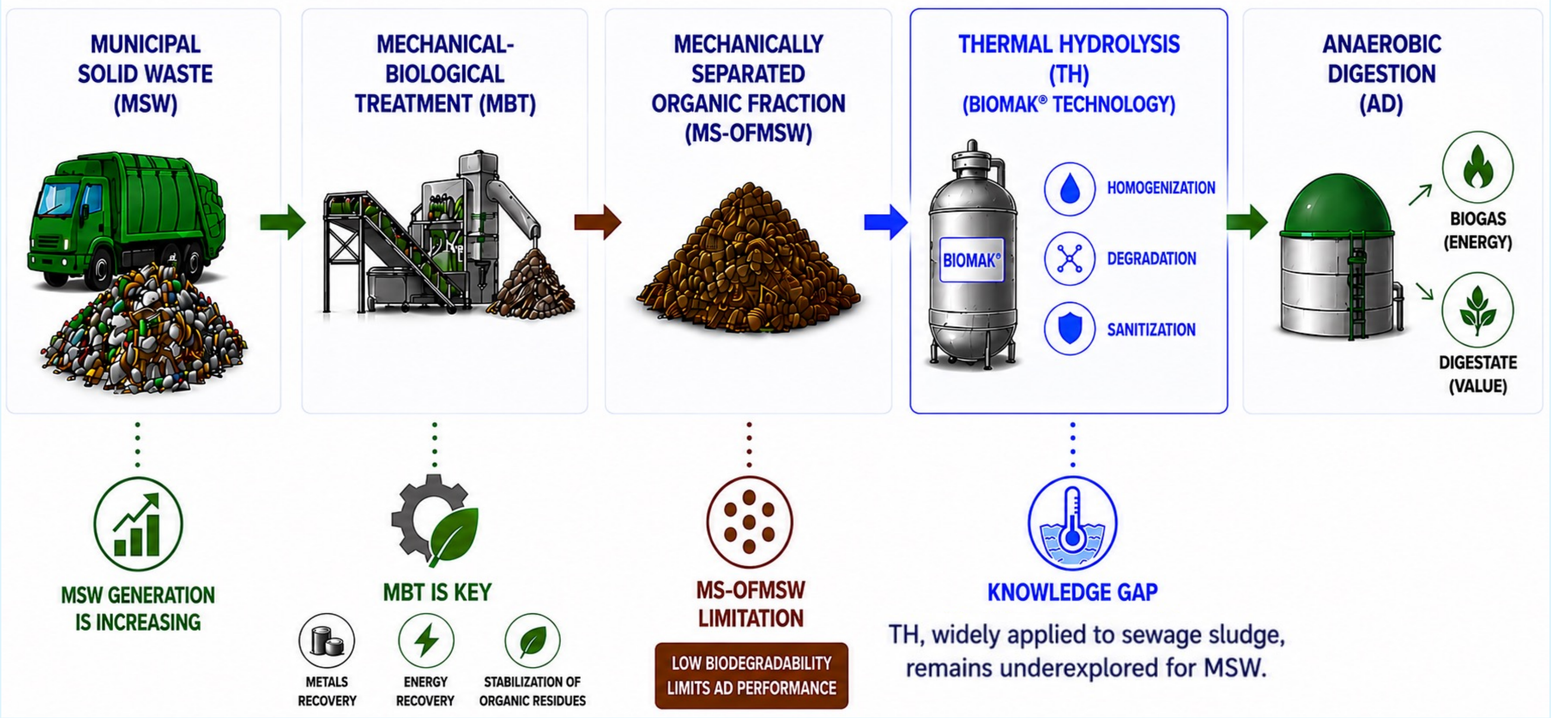
Introduction



This study

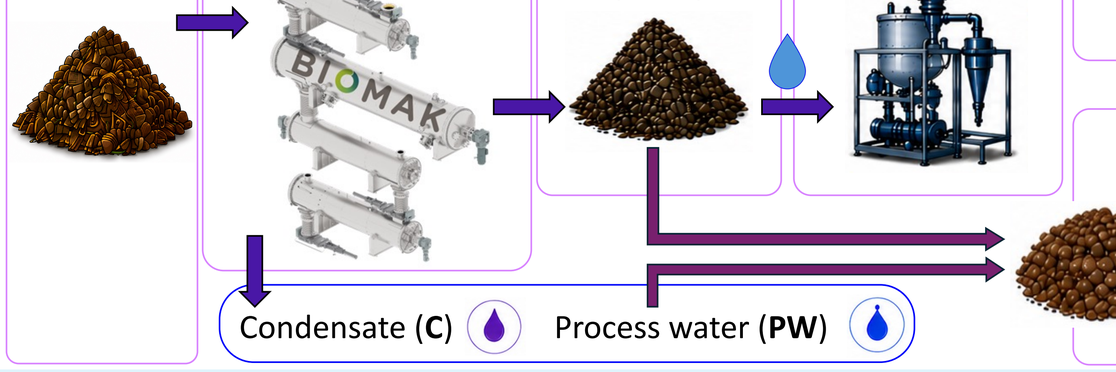
Evaluates the potential of BIOMAK® technology to enhance biodegradability and improve anaerobic digestion performance of MS-OFMSW

Objectives

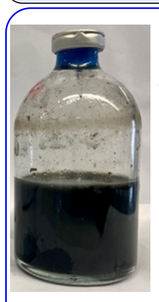
- ✓ To evaluate **BIOMAK® industrial-scale thermal hydrolysis** as **pretreatment** for **MS-OFMSW**.
- ✓ To quantify **improvements** in **methane production**.
- ✓ To assess **process stability** and **potential inhibition** effects.
- ✓ To identify **optimal substrate** configuration for **AD** integration.

Materials & Methods

Step 1: Pretreatment



Step 2: Biochemical methane potential



Substrates used:
- **MS-OFMSW**
- **THOF**
- **Biopulp**
- **BO-Mix**

Inoculum: 15 g VS/L
Inoculum/Substrate ratio: 2 (VS basis)
Temperature: 36 °C

Step 3: Characterization

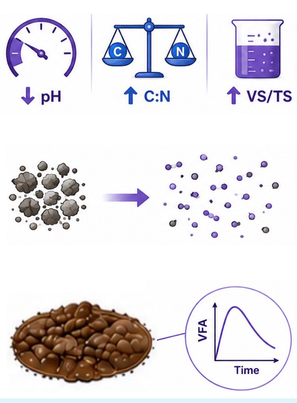
- Total solids (TS), volatile solids (VS)
- Total chemical oxygen demand (TCOD)
- Soluble chemical oxygen demand (SCOD)
- Volatile fatty acids (VFA)
- Biogas volume and composition (GC-TCD)
- Total alkalinity (Alk), pH
- NH_3 Total ammonia nitrogen (TAN)
- N Total Kjeldahl nitrogen (TKN)
- Ultimate and metals analysis

Results & Discussion

A. TH impact

Table 1 – Substrates characteristics

	pH	VS/TS (%)	TCOD (g O_2/kg)	C:N
MS-OFMSW	7.5	61	576.6	14
THOF	6.2	67	511.1	24
Biopulp	4.5	70	167.9	26
BO-Mix	6.2	69	437.2	26
C	4.6	1	16.6	4
PW	5.0	70	63.5	9



TH improved substrate characteristics for AD.

TH increased solubilization promoting biodegradability.

Biopulp presented a high acid concentration.

B. Organic matter time-course

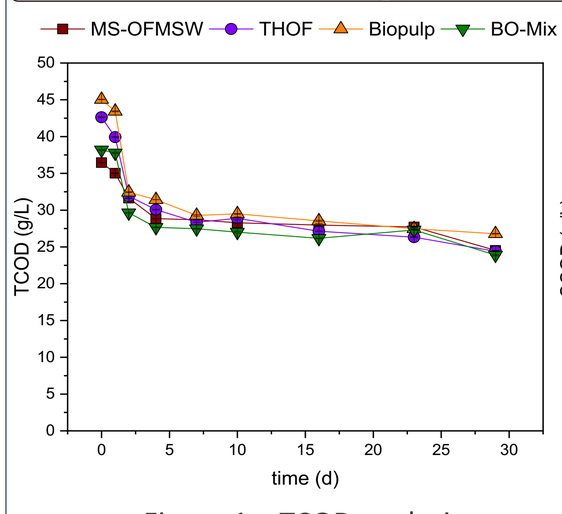


Figure 1 – TCOD evolution

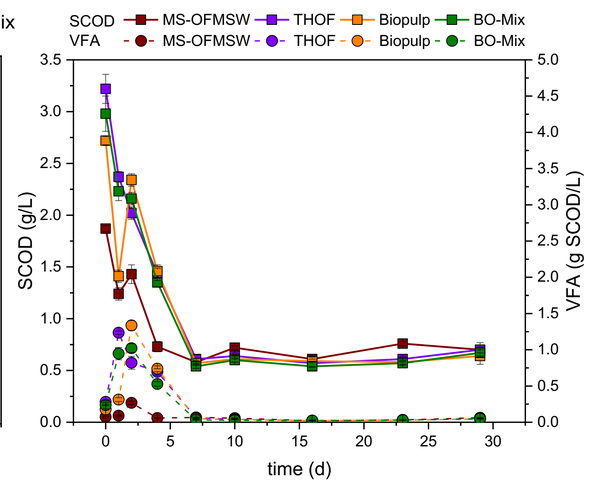


Figure 2 – SCOD and VFA evolution

Higher organic matter degradation, Rapid SCOD release and early VFA generation.

Faster intermediate consumption promoted early stabilization.

TH accelerated both hydrolysis and acidogenesis steps of AD.

MS-OFMSW exhibited slower hydrolysis and residual intermediates concentrations.

C. AD performance

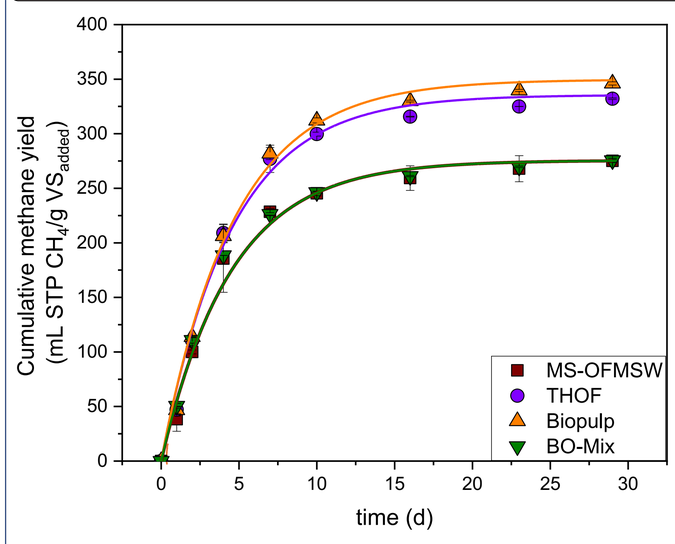


Figure 3 – Methane yields

Biopulp (+26%)
THOF (+21%)
Methane enhancement compared to MS-OFMSW.

BO-Mix inhibition linked to **aromatic compounds** in **C** and **PW**.

Conclusions

BIOMAK® TH enhanced MS-OFMSW anaerobic digestion performance.

↑Biodegradability

↑Organic matter removal

↑Methane production

Biopulp was the optimal substrate configuration.

Inhibitory compounds must be controlled.

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