Methane potential of oat husk waste streams in anaerobic digestion

Tuominen Sonja[1,2] (BSc), Allahverdiyeva-Rinne Yagut (PhD)[1], Vähäsalo Lari (DSc (Tech.))[2]
[1]Department Life Technologies, University of Turku, [2]CH-Bioforce Oy, Raisio

BIOTECHNOLOGY (tech.)

Introduction and objective

Oat grains production creates up to 6,5 million metric tons of oat husks. CH-Bioforce Oy's process utilizes oat husks to extract biopolymers. Oat husks also contain pulverized grain material, oat husks powder, which is removed before processing. The process also produces a hemicellulose permeate as waste stream.

In this study these sidestreams are anaerobically digested with industrial inoculum that produces biogas. The objective of this study is to see if oat husks powder and hemicellulose permeate are potential in biomethane production.

Chemical analysis

Sample	Moisture (%)	Dry content (%)	Ash (%)	Lignin (%)	Volatile solids (%)
Oat husks powder	1.22	98.78	6.53	0.19	92.06
Hemicellulose permeate	97.23	2.62	1.07	–	1.70
Microcrystalline cellulose (Sigma Aldrich®)	5.58	94.42	≤ 0.1	0.00	94.32
Inoculum	94.32	5.68	0.02	–	5.66

Before starting the fermentation, chemical analysis is conducted for raw materials and inoculum using various methods: ash, extractives and lignin analysis, hydrolysis and methanolysis.

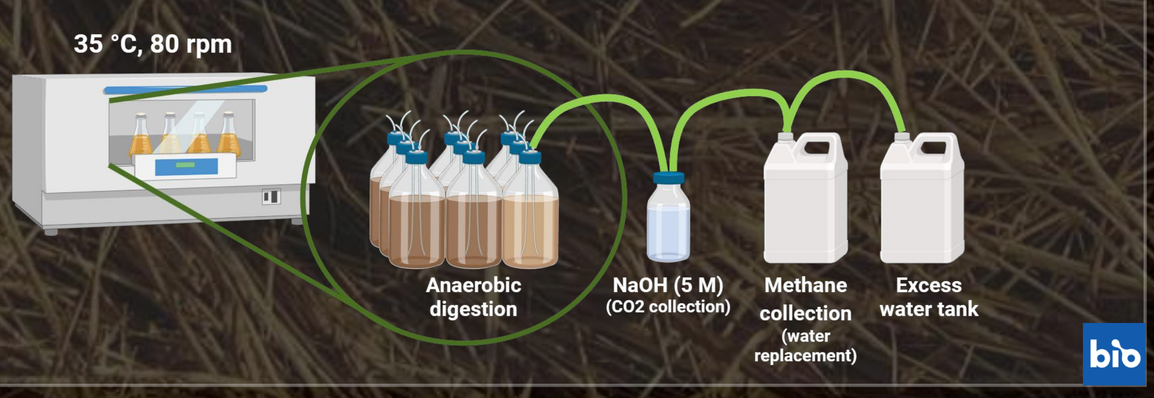
Hydrolysis and methanolysis results gave unreliable results, so other methods are considered for carbohydrate analysis.

Digestion

Methane production is conducted using anaerobic digestion with industrial inoculum. Digestion set–up included three inoculum controls, three microcrystalline cellulose controls, and three sample cultivations. Digestion is located in a warm shaker incubator for 30 days.

Biogas produced in the digestion is led to sodium hydroxide to capture carbon dioxide, after which methane is collected. Methane production is estimated by measuring the weight of the collection canisters.

Digestion set–up:



Conclusions and discussion

Oat husks powder has potential to produce methane approximately 350 ml/g volatile solids but realistically around 60 % of potential is reached in literature.

If this study shows results of high volume of methane produced, a sustainable biomass can be used for biomethane production.

BIOFORCE™
The Bioforce of Nature