ENHANCING BIOGAS PRODUCTION FROM WHEAT STRAW THROUGH LIGNINOLYTIC FUNGI PRE-TREATMENTS AND CO-DIGESTION WITH PIG SLURRY

Ciro Vasmara¹, Stefano Cianchetta², Rosa Marchetti¹, Stefania Galletti²

¹CREA - Unità di Ricerca per la Suinicoltura
Via Beccastecca 345, 41018, San Cesario sul Panaro (MO), Italy

²CREA - Centro di Ricerca per le Colture Industriali
Via di Corticella 133, 40128, Bologna, Italy
The interest in sustainable biogas production is currently oriented towards the use of agricultural byproducts instead of high-input dedicated crops.
These byproducts contain large lignocellulosic fractions that could be exploited to increase methane production. A biomass pre-treatment step could facilitate anaerobic digestion by partial lignin removal.
Biological pre-treatments seem suitable to achieve sustainable biogas production due to low energy requirement, low pollution generation, and simple procedures and equipment.
Biological pre-treatment can be carried out by Basidiomycetes white-rot fungi which are considered among the most effective biological pre-treatment agents.
Wheat straw is the most abundant agricultural residue in Europe, the use of straw for the production of biogas represents a sustainable option, since it does not compete with human food resources.
The aim of this study was to carry out a comparison among ligninolytic (white-rot) and cellulosolytic (Trichoderma) pretreated wheat straw, for biogas production potential, without or with pig slurry in codigestion.
SCREENING TEST

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C. subvermispora

T. versicolor

C. stercoreus

P. ostreatus

P. chrysosporium

Trichoderma
SCREENING TEST

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CO-DIGESTION

Enhancing biogas production from wheat straw through ligninolytic fungi pre-treatments and co-digestion with pig slurry.

Days of incubation

Cumulated CH₄ mL g⁻¹ VS

0 15 30 45 60 75 90
0 50 100 150 200 250 300 350 400

UNTR
PHA
RUT
SUB

R +17%

4 weeks
10 weeks
CO-DIGESTION

Theoretical Observed

Cumulated CH₄, mL g⁻¹ VS

UNTR SUB10

+ 10% CH₄
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Methane production in monodigestion was measured after pre-treating the wheat straw with *P. chrysosporium* for 14, 18, 21 and 24 days.

**NS** : not sterilized straw

**S** : sterilized straw

**AF** : formic acid
PHANEROCHAETE

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Wheat straw pre-treatment

H_{max} (mL CH_{4} cumulated)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>H_{max} (mL CH_{4} cumulated)</th>
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<tbody>
<tr>
<td>AF</td>
<td>171</td>
</tr>
<tr>
<td>NS</td>
<td>165</td>
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<tr>
<td>S</td>
<td>172</td>
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CONCLUSIONS

- R  +81% in monodigestion
  +17% in co-digestion

- CH₄ UP TO +31% in monodigestion

- CH₄ + 12% P.chrysosporium 18 days
  + 17% P.chrysosporium 21 days
CONCLUSIONS

✓ NO POLLUTION
✓ NO COSTS FOR ENERGY INPUT
✓ NO PRODUCTION OF INHIBITORS
✓ SINERGY IN CO-DIGESTION
THANK YOU!