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L’Oréal UNESCO For Women In Science - Levant and Egypt fellowship prize

Green Technology Investments and Access to Sustainable Financing in the Arab Region
04-06 March 2019
Olive mills wastewater (OMW) treatment for biogas production and re-use in agricultural irrigation
Challenges???

- **OMW production:**
  - Mediterranean countries: 7 - 30 million m³/year.
  - Syria: one million m³/year.

- **Discharge:**

- **Treatment**
  Effectiveness, Complexity, and Cost.
Challenges in Syria???

- **Laws:**
  - Discharge
  - Irrigation (50-80 m³/ha/year)?

<table>
<thead>
<tr>
<th>Phenols (mg/l)</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>400-14300</td>
<td>OMW</td>
</tr>
<tr>
<td>2</td>
<td>Water allowed for treatment plants</td>
</tr>
<tr>
<td>0.002</td>
<td>Irrigation water</td>
</tr>
<tr>
<td>$10^5 - 10^6$</td>
<td><strong>Water dilation (L)</strong></td>
</tr>
</tbody>
</table>
Action

- Experiments:
  - 4 Mills in Latakia.
  - Aerobic treatment.

<table>
<thead>
<tr>
<th>Sample N</th>
<th>Untreated</th>
<th>AZ</th>
<th>Bread Yeast</th>
<th>PSB</th>
<th>Molas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>2</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>3</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>4</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Phenol reduction 85% using PSB and no dilation
Anaerobic treatment
Fermenting unit
Fermenting unit

3 m³/month biogas
85% Phenol reduction
Biogas

- Anaerobic treatment
- Contain (50-70% CH4, 20-40% CO2, 1-10% H, N, O2, CO, H2S).
- Methane (CH4):
  - No smoke.
  - Blue flame.
  - Higher thermal energy (2-3 times) compared to the gas currently used in our homes.
  - Theoretically:

<table>
<thead>
<tr>
<th>OMW</th>
<th>CH4</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 m³</td>
<td>35 m³</td>
<td>70 kWh</td>
</tr>
<tr>
<td>1 M m³/year</td>
<td>35 M m³/year</td>
<td>70 M kWh/year</td>
</tr>
</tbody>
</table>
Quinoa seed germination

W 50% T 50% U T U
Quinoa growing

Higher production (number and weight) for 5% Treated OMW compared to the other treatment.

8.7% and 14% higher compared to using Water
Perspective

- Consider revising the government laws, so that it could reflect the scientific results.
- Consider Full/partial Financing of unit distribution for local use in the villages.

Research

- Modifications and improvement of fermentation unit.
- Study characteristics of biogas.
- Study the response of different crops to OMW use in irrigation.
- Factors affecting aerobic and anaerobic fermentation.
Climate change and you?!  
Thank you for your attention
حجرة الخروج

خزان الغاز

حجرة الدخول

الهاشم المخمر