SUSTAINABLE OLIVE OIL PRODUCTION

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World wide olive oil production

Europe 84%
Africa 8.5%
Asia 5.5%
America 2%
European Olive Oil Production

- Spain: 42%
- Italy: 20%
- Greece: 18%
- Other countries: 20%

Greek situation

- The olives and olive oil are inextricable part of Greek culture
- In Greece there are 150,000,000 olive trees cultivated in 765,000 hectare
- The yearly production of each tree rises up to 300 kg of olives
- The 1/3 of Greek farmers are working on cultivation of olives
- Olives and olive oil production in Greece rise up 1,750,000 tn and 400,000 tn respectively
Situation in Greece

INSTALLATIONS

- 2,633 olive oil mills
  - 2,152 centrifugal systems (mostly 3-phases)
  - 481 traditional (pressure squeezing)
- 35-40 pomace processing plants

Olive oil production per region
Environmental impact from olive oil production

- Olives: 1000 kg
- Water: 1479 kg
- 359 kg Emissions
- Olive oil production:
  - 212 kg Olive oil
  - 238 kg Solid wastes
- Wastewater: 1670 kg

Characteristics of OMWW

<table>
<thead>
<tr>
<th>parameter</th>
<th>OMWW</th>
<th>ENQL</th>
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<tbody>
<tr>
<td>pH</td>
<td>4.50</td>
<td>6-9</td>
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<tr>
<td>BOD, g/l</td>
<td>68.71</td>
<td>0.04</td>
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<tr>
<td>COD, g/l</td>
<td>158.18</td>
<td>1</td>
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<tr>
<td>Phenolic compounds, g/l</td>
<td>17.15</td>
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<tr>
<td>Conductivity, mmhos/cm</td>
<td>18.00</td>
<td>3</td>
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Evaporation ponds

- This is the common used method of OMW treatment in Greece
- There are about 400 installations in Greece

An OMWW evaporation pond
METHODS OF OMW TREATMENT
case studies in Greece

Physical methods
- Evaporation ponds (lagooning)

Biological methods
- Anaerobic digestion
- Use of OMW for irrigation of olive groves
- Co-composting of OMW with OSWR
- Detoxification by Nitrogen fixation (Bio-wheel method)

Physicochemical methods
- Membranes technology combined with evaporation and wet oxidation (EHO method)
- Phenolic compounds removal using ion exchange technology

Combined Chemical and biological methods
- Fenton oxidation following by co-composting with pomace

Proper characteristics for any success treatment method

- To be technical effective
- To be integrated
- To be feasible
- To meet all Environmental limits
Basic concept of the innovation

**Simple Flow Diagramme of the Method**

- Olive tree cultivation
- Olive oil production (Olive mill)
- 200 kg olive oil
- 1000 kg olives
- Solid wastes:
  - 186.14 kg Carbon
  - 1.39 kg Nitrogen
  - 0.48 kg Phosphorus
  - 3.13 kg Potassium
  - 0.46 kg Calcium
- Wastewaters
- Return back to the tree: all the elements that it needs for growth up
- CO-COMPOSTING HUMIFICATION
Fenton oxidation following by co-composting with pomace

Advantages of the method

- It is an integrated method for OMWW management
- There are no emissions.
- The method could be feasible if the soil conditioner that is produced will take a good price in the market
- It is simple to install and to operate from the owners of Olive mills

Commercial Product
Cultivation of grapes

Grape for wine making

0% and 10% mixture of Humo Olea with conventional soil

Comparison after two months cultivation

Καλλιέργεια εσπεριδοειδών
The business model

- ECO-ORGANIC Ltd
- Olive Mill owner
- Olive’s producer

OTHER CONSUMERS
Installations for Humo Olea production

Humo Olea Production units

Chania, Crete
Detoxification unit
1st stage of cocomposting of oxidized OMW with pomace, Chania, Crete

2d stage of co-composting Chania, Crete
Katastari, Zakinthos

Koutsouras, Creta
INTEGRATED SOLUTION

INTEGRATED UTILIZATION OF OLIVE OIL PRODUCTION WASTES

Market limitation
Productivity limitation

Accumulative needs for all biological cultivations
Thank you