ORGANIC MUNICIPAL SOLID WASTE TREATMENTS AND OTHER MICROORGANISMS APPLICATIONS
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INTRODUCTION

Objectives
- Brief introduction about solid waste issues and different types of treatments.
- Make people aware of other microorganisms applications in our daily life.
- Create teaching material to explain it all to Senior students in a participative lesson.
- Analysis of the lesson and the perspective future.

What do we do with the solid waste?
- The Catalan model of municipal solid waste treatment is based on the correct residues separation in five fractions: plastic, paper, glass, organic fraction and waste.
- The main objectives of the Residues Catalan Agency are:
  - Increase the amount of waste which is separated correctly to achieve a 48%.
  - Decrease in a 10% of individual generation.
- In order to do it, it is completely necessary to make people understand the importance of the residues correct separation, so that the improvement and individualization of treatment methods will be easier.

How much waste do we generate in our day?
The amount of waste that we generate has increased in the last years. It is caused by two main factors:
- World’s population increase.
- Development of the industry and countries.
The amount that generates a single person may not seem a big problem, but if it is multiplied by the number of people who lives in a middle village it becomes an issue that have to be solved.

ORGANIC SOLID WASTE TREATMENTS AND MICROORGANISMS APPLICATIONS

Incorporation

- Terminal treatment
  - ADVANTAGES
    - Reduce waste volume
    - Revalorization of the heat into electricity.
  - DISADVANTAGES
    - Be aware of toxic residues
    - Expensive treatment of the gasses produced

Composting

- Biological aerobic treatment
  - ADVANTAGES
    - Compost production
    - Less costs and simple process
  - DISADVANTAGES
    - Needs energy
    - N and C source

- Microorganism applications in our daily life

Microorganisms not only cause disease, but also have lots of applications that are essential in our daily life. Knowing the microorganism diversity and its necessities is essential to take profit of them.

From food, drugs, fuel, flavoring to environmental applications are some of microorganisms uses and the industry related to it has increased a lot in the last years. Nevertheless, its essential the social acceptance of science to keep going with its development, so it is important to make people understand it all.

Anaerobic digestion

- Biological anaerobic treatment
  - ADVANTAGES
    - Biogas production
    - Needs strict control
  - DISADVANTAGES
    - Complex and sensible process

Microorganism

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Product</th>
<th>Applications</th>
</tr>
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<tbody>
<tr>
<td>Saccharomyces cerevisiae</td>
<td>Beer, wine, bread</td>
<td>Food</td>
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<tr>
<td>Saccharomyces cerevisiae</td>
<td>Ethanol</td>
<td>Fuel</td>
</tr>
<tr>
<td>Corynebacterium glutamicum</td>
<td>Glutamate</td>
<td>Flavoring</td>
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<td>Acid lactic bacteria</td>
<td>Lactic derivatives</td>
<td>Food</td>
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<td>Aspergillus niger</td>
<td>Citric acid</td>
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<td>Penicillium chrysogenum</td>
<td>Penicillin</td>
<td>Drugs</td>
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<td>Recombinant bacteria</td>
<td>High value proteins</td>
<td>Drugs</td>
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<td>Nitrification and denitrification bacteria</td>
<td>Waste water treatment</td>
<td>Environment</td>
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</tbody>
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METHODOLOGY AND FUTURE PERSPECTIVES

In order to make people aware of waste issues and other applications of microorganisms, it has been created a lesson for 16 to 18 years high school students, following the next steps:
1. Doing an issue analysis.
2. Creating the lessons’ objectives to solve the needs observed in the previous point.
3. Creating activities to accomplish the objectives and generate its material support.
4. Doing a results analysis using a the test answered by the students after the lesson.

The final aim of the lesson is to make the students participate while they are learning.

Analyzing the results obtained, the main conclusions are:
- A) Did you know what do we do with plastic, paper and glass residues?
- B) Did you know what do we do with the organic residues?
- C) After the lesson will you be able to explain what we do with the organic fraction?

Results and future perspectives

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<th>A)</th>
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References