

ORGANIC MUNICIPAL SOLID WASTE TREATMENTS AND OTHER MICROORGANISMS APPLICATIONS

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INTRODUCTION

Objectives

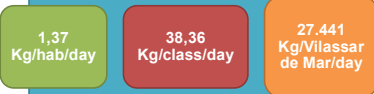
- ➔ Brief introduction about solid waste issues and different types of treatments.
- ➔ Make people aware of other microorganisms applications in our daily life.
- ➔ Create teaching material to explain it all to Senior students in a participative lesson.
- ➔ Analysis of the lesson and perspective future

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 ¹:

- ➔ World's **population** increase.
- ➔ Development of the **industry** and **countries**.

The amount that generates a single person ² 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.



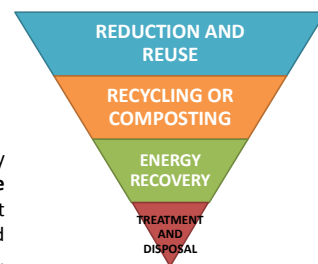
What do we do with the solid waste?

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 are³:

- ➔ 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.

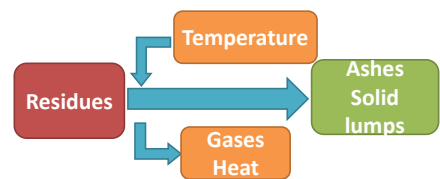


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Incineration

Termical treatment³

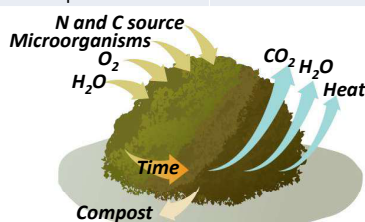
| ✓ ADVANTAGES | ✗ DISADVANTAGES |
|--|--|
| Reduce waste volume | Be aware of toxic residues |
| Revalorization of the heat into electricity. | Expensive treatment of the gasses produced |



Composting

Biological aerobic treatment³

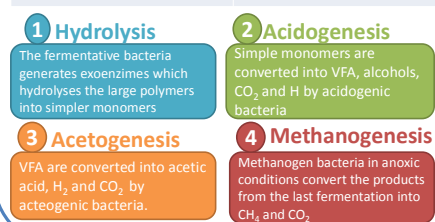
| ✓ ADVANTAGES | ✗ DISADVANTAGES |
|-------------------------------|-----------------|
| Compost production | Needs energy |
| Less costs and simple process | |



Anaerobic digestion

Biological anaerobic treatment³

| ✓ ADVANTAGES | ✗ DISADVANTAGES |
|-------------------|------------------------------|
| Biogas production | Complex and sensible process |
| | Needs strict control |



Microorganism applications in our daily life

| Microorganism | Product | Applications |
|--|-----------------------|--------------|
| <i>Sacharomyces cerevisiae</i> | Beer, wine, bread | Food |
| <i>Sacharomyces cerevisiae</i> | Ethanol | Fuel |
| <i>Corynebacterium glutamicum</i> | Glutamate | Flavoring |
| <i>Acid lactic bacteria</i> | Lactic derivatives | Food |
| <i>Aspergillus niger</i> | Citric acid | Food |
| <i>Penicillium chrysogenum</i> | Penicillin | Drugs |
| <i>Recombinant bacteria</i> | High value proteins | Drugs |
| <i>Nitrification and desnitrification bacteria</i> | Waste water treatment | Environment |

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 ⁴.

Nevertheless, its essential the social acceptance of science to keep going with its development, so it is important to make people understand it all.

METHODOLOGY AND FUTURE PERSPECTIVES

Teaching methodology

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**⁵.

References

1. Farquhar G, McBean E, Rovers A. Opportunities for reduction, reuse and recycling. Solid Waste Landfill engineering and design. New Jersey:Prentice-Hall, 1995: 7-39
2. Institut d'Estadística de Catalunya, 2014. [URL: www.idescat.cat]
3. Agència de Residus de Catalunya, 2014. [URL: <http://www.20.residus.cat/portal/site/arc/>]
4. Ratledge C, Kristiansen B. Basic Biotechnology. Cambridge: Cambridge University Press, 2006.
5. Antó C, Estellés P, Juan D, Martínez S, Silva B, Vilella M. Informe FEDAIA, Fracàs escolar a Catalunya, FEDAIA 2012

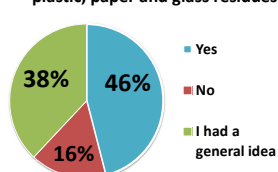
Results and future perspectives

Analyzing the results obtained, the main **conclusions** are:

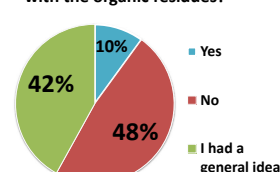
- ➔ **Previously** to the lesson (graphics A and B), students know more about what do we do with plastic, paper and glass than who we treat the organic fraction. In the first case just **16%** of the students answer that they do not know the treatments comparing to **48%** in the second case
- ➔ **After** the session (graphic C), the general knowledge about who we treat the organic fraction and other applications of microorganisms has increased. Just **4%** of the students answer negatively.

Due to its efficacy, using the lesson created to explain the issue to more people, would help to make them aware of it.

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 do we do with the organic fraction?

