# ZIENTZIA AZOKA

# 2021-2022

**TITLE OF THE PROJECT: THE NEW ORGANIC PLASTIC**

GROUP: **CMC**

NAMES: **Izaro Cossio , Aroa Castro and Amaya Mateo**


**Hypothesis:** We can create plastic with potatoes?

**Summary:**

In our society, one of the biggest problems is the dependence on hydrocarbon products and, in particular, our concern is focused on the massive use of non-biodegradable plastics.
The plastics that are used on a daily basis are single-use, have high production costs and, after use, cause major environmental problems as they are not biodegradable.
At the beginning of this project we asked ourselves whether we could contribute by producing plastics from renewable materials such as potatoes, at low cost and also that the plastics produced could be easily degraded.

**Materials and methods:**

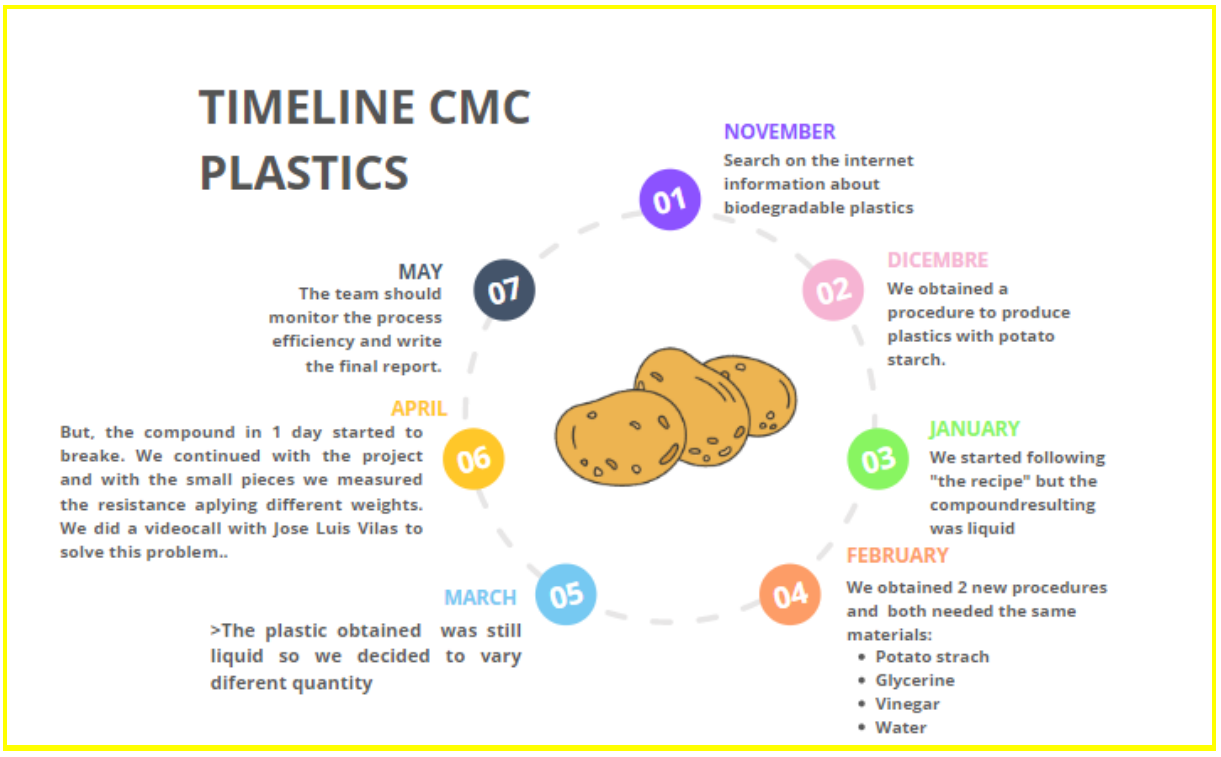
The materials we have used are listed below

- Potato and Starch
- Grate
- Water
- petri dish
- white vinegar
- food colouring

- Glass
- pipette Pasteur,
- electric plate
- casserole
- Bicarbonate
- glycerine,
- 0,1 molar of hydrochloric acid
- 0.1 molar sodium hydroxide.

**Chronogram**

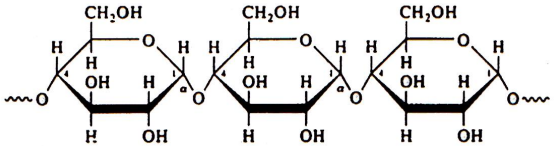
In order to carry out this project, we have organised our work in the following way:



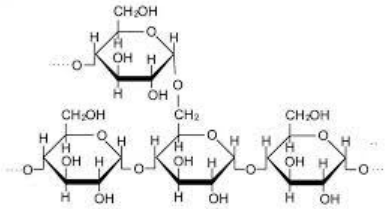
## Procedure

First we put 20 grams of starch on a bowl, then 7,5 mL of vinegar, 7,5 mL glycerine and finally, 25 mL of water. All that we mix during we were warming.
Potato starch contains amylose and amylopectin, so it is necessary to use hydrochloric acid (0.1 M) to break down the amylose molecule.
NaOH (0.1 M) is then used to neutralise the pH.

Amylose



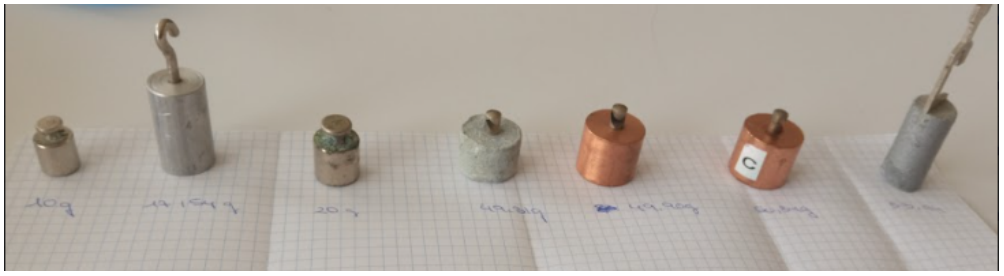
Amylopectin

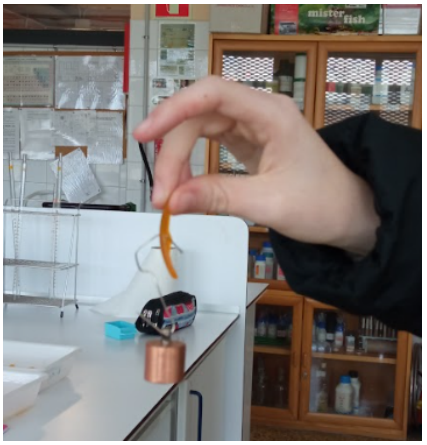



Amylopectin has to be broken because **it does not require isomaltase, and does not have the steric hindrance caused by the branch points**

## Resistance

Finally, we measured all the plastic pieces, to see how much weight they can support.





**Graphic representation:**

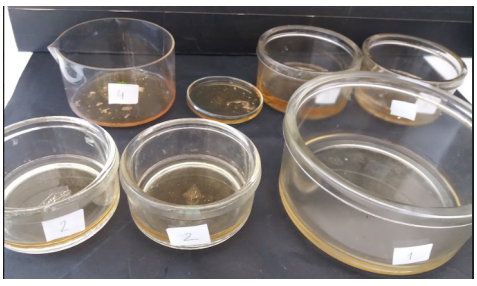
**PLASTIC 3**

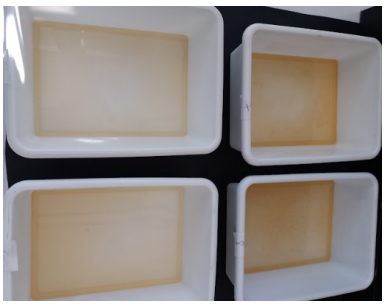
| | 10g | 17,54g | 20g | 49,31g | 49, 90g | 50,34g | 53,93g | 148,08g | 198,46g | 500,34g |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | Starts breaking slowly |
| 2 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | In 2 minute Starts breaking |
| 3 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | In 1 minute and 51 second Starts breaking |

**PLASTIC 8**

| | 10g | 17,54g | 20g | 49,31g | 49, 90g | 50,34g | 53,93g | 148,08g | 198,46g | 500,34g |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ |
| 2 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ |
| 3 | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ | ✅ |

**Results**





We also tried another experiment and we used

0.1 molar of hydrochloric acid,

0,1 molar of sodium hydroxide,

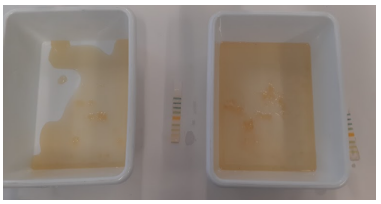
25 ml of water,

2,5ml of glycerol and

2,5 g of potato starch.

We put it on fire and after 15 minutes we put it in a beaker. The next day the plastic appeared broken and a very thin layer .

So we couldn't do the test of  resistance .



## Conclusions

Lack of time has led us to carry out the experiments with commercial starch because of the great laboriousness involved in obtaining starch from fresh potatoes.

We also observed that the polymers obtained were fragile but still supported well the weight we suspended from them.

In the future, it would be advisable for the experiments to be carried out on potatoes, for the polymer obtained not to be as fragile as it was and for the degradation speed to be tested.


### AKNOWLEGMENTS

We would like to thank Elhuyar for giving us the opportunity to participate in Zientzia Azoka.

We would also like to thank Jose Luis Vilas for agreeing to be our mentor and for helping us to solve the problems we have had in our project.


## BIBLIOGRAPHY


- https://www.jamesdysonaward.org/en-SE/2018/project/potato-plastic/ last day opened 06 /05 /2022
- https://edu.rsc.org/experiments/making-plastic-from-potato-starch/1741.article last day opened 06 /05 /2022
- https://www.instructables.com/Make-Potato-Plastic!/ last day opened 06 /05 /2022
- https://www.youtube.com/watch?v=H1eJsjqilKg last day opened 06 /05 /2022

- https://www.york.ac.uk/media/ciec/potatoestoplastics/makingplasticfrompotatostarch/A5%20T.pdf last day opened 06 /05 /2022
- https://www.york.ac.uk/media/ciec/potatoestoplastics/fullpdf/Potatoes%20to%20Plastics%20Full.pdf last day opened 06 /05 /2022