

## Fantastic Bioplastic Teachers' sheet

### Objectives:

- To create biodegradable plastic from corn starch
- To understand the application of bioplastic

### Resources:

- Make your own bioplastic quiz sheet
- Fact sheet: Know the Difference: Degradable, Biodegradable and Compostable Plastic
- Laminated instruction sheets for cornstarch from plastic activity

### Background information:

Biodegradable means that a certain material is capable of being decomposed, or broken down by microorganisms.

Many of the plastics that we use today are not biodegradable.

Some types of plastics degrade faster than others, but depending on the type of plastic, it may never break down. Much of it goes to landfill, but it can also end up in waterways. This is becoming a huge problem for our environment and our wildlife, as it is very detrimental and can destroy habitats for us and other organisms.

One giant example of this type of pollution is known as the Great Pacific Garbage Patch which is a massive body of rubbish (mostly plastic) located in the middle of the Pacific Ocean. It exists because rubbish polluting our waterways builds up and is forced out into the ocean by currents and wind. Even though plastic does not biodegrade, it can break off in small pieces that animals might think is food. If the animals eat this plastic, they can get sick and possibly die. Animals can also get entangled in waste, making it difficult or impossible for them to eat, swim, or fly. This massive amount of pollution has killed all kinds of wildlife: from birds and turtles to many other aquatic species (show YouTube video).

What can we do to prevent plastic pollution like this? Of course, recycling plastic or reusing it is an option. Another option is our plastic consumption. These measures could drastically

cut down on the amount of waste that litters the earth. However, there are new innovations that could prove beneficial to using plastics sustainably.

Most traditional plastic is made from petroleum, a non-renewable resource that is harvested by drilling into the earth. One way that scientists and inventors are trying to solve the plastic dilemma is by creating bioplastic and compostable plastic made from materials that break down quickly. A newer technology that could be a sustainable alternative to traditional plastic is called bioplastic. The most common type of bioplastic is made from renewable materials, such as corn starch. It takes less processing, and therefore energy, to make bioplastic. Bioplastics are considered carbon neutral because the plants grown to make the plastic remove as much carbon dioxide from the atmosphere as is put into it during the manufacturing process.

Some types of bioplastic are biodegradable and even compostable.

Biodegradable plastic can be broken down by the metabolism of bacteria and fungi. However, the breakdown of biodegradable material buried in landfills can be slowed down or even stopped because many of these processes need oxygen and water and there is little, to none, in landfills.

Some bioplastic is processed in a way that is non-biodegradable. The plastic is still degradable but it cannot be processed by microorganisms.

Compostable plastic degrades leaves no visible, distinguishable or toxic residue.

Bioplastics on a whole take less energy to produce, but must be recycled carefully.

## **Complete plastics from cornstarch activity and afterwards get students to answer the bioplastic question sheet**

### **Version 1.**

#### **Materials**

1 tablespoon of cornstarch

1 teaspoon of vinegar

1 teaspoon of glycerin

4 tablespoons of water

Few drops of food colouring

Measuring spoons

Bowl

Mixing spoon

Foil

Microwave

### **Procedure:**

1. Add all the ingredients to the bowl and mix them together until combined.
2. Microwave your plastic in 15 second bursts, stirring regularly to avoid clumping. It will be a milky colour at first, but will soon get thicker and turn slightly translucent. (Caution: it will be VERY hot)
3. Once the mixture is scoopable, stir a few times and then pour/scoop the mixture onto the foil.
4. The mixture will feel similar to hair gel, and will need to cool a bit before it can be formed. Let it sit for a minute or so, then spread with a knife/spoon. on the foil. Over the next 15 minutes, the plastic will begin to harden and not stick to fingers when touched, but it will still be soft. The plastic should be left alone for several hours, until completely set.
5. If you wish to form the plastic into a small bowl or other simple shape, it can be left on the foil for about an hour, then formed almost like playdoh. After forming, set it back on the foil and allow to dry for several hours or overnight. Resist the urge to touch the finished product throughout the drying process, as it will still be soft.

## **Version 2.**

### **Materials**

1 tablespoon of cornstarch

1.5 tablespoons of water

3-5 drops of cooking oil

Food colouring



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BDC Biorenewables  
Development Centre  
Plants • Processes • Products

Measuring spoons

Pipette

Bowl

Mixing spoon

Foil

Microwave

**Procedure:**

1. Add all the ingredients to the bowl and mix them together until combined.
2. Microwave in 15 second bursts. The mixture should start to bubble and should become slightly transparent.
3. When it looks transparent, stop heating it. Let it cool a bit so you can handle it.
4. Knead it until it is soft and can be moulded like play-dough. Now you can mould it into whatever shape you want it to be.
5. Leave it for 24 hours to cure and become solid.

# Make your own bioplastic

## Pupils' sheet

### Version 1.

#### Materials

1 tablespoon of cornstarch  
1 teaspoon of vinegar  
1 teaspoon of glycerin  
4 tablespoons of water  
Few drops of food colouring  
Measuring spoons  
Bowl  
Mixing spoon  
Foil  
Microwave

#### Procedure:

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## Version 2.

### Materials

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3-5 drops of cooking oil

Food colouring

Measuring spoons

Pipette

Bowl

Mixing spoon

Foil

Microwave

### Procedure:

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# Make your own bioplastic

## Pupils' sheet

1. What is meant by the following terms:
  - a) Biodegradable
  - b) Renewable
  - c) Pollution
2. How do bioplastics play a role in the ecosystem?
3. Who benefits from bioplastics?
4. Do you think people know about bioplastics? What is the best way to tell people about them?
5. Why aren't all plastics bioplastics or biodegradable?



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# Make your own bioplastic

## Teachers' sheet

Ask pupils to do some research to find answers to the following questions.

There is a good downloadable sheet available here: [https://docs.european-bioplastics.org/2016/publications/fs/EUBP\\_fs\\_what\\_are\\_bioplastics.pdf](https://docs.european-bioplastics.org/2016/publications/fs/EUBP_fs_what_are_bioplastics.pdf)

This site also has some good information: <https://www.activesustainability.com/environment/what-are-bioplastics/>

1) What is meant by the following terms:

a) Biodegradable – **means it can be broken down by the metabolism of bacteria and fungi.**

b) Renewable – **a natural resource that is not depleted when it is used**

c) Pollution – **the introduction into the environment of a substance which has harmful or poisonous effects**

2) How do bioplastics play a role in the ecosystem?

**When a plastic is biodegradable it can be digested by bacteria and fungi, meaning that these plastics can be processed by and become part of organic living things.**

3) Who benefits from bioplastics?

**Everyone!**

4) Do you think people know about bioplastics? What is the best way to tell people about them?

**Social media, television, education, word of mouth etc.**



5) Why aren't all plastics bioplastics or biodegradable?

**Lack of awareness of the plastic problem. Demand from consumers. Cost of conventional vs bioplastics.**

6) Are there any disadvantages of bioplastics?

**Often will only break down in certain conditions – not a solution to marine pollution.**

**Cannot be recycled with most other plastics.**