

Lesson 7: Biodegradable and compostable materials

Objectives

1. Test the biodegradation of various common materials, including mycelium composite.
2. Distinguish between biodegradable and compostable materials.



Pre-module task

It is advisable to complete this task before the module begins. After a month's time, the samples will be ready to analyze.

1. Cut 80 x 80 mm squares of various materials. One of them should be mycelium material. Others may be cabbage leaves, thin woven fabric, newspaper, plastic bags, aluminum soda can, etc.
2. Take a picture of your cut-out materials.
3. Fill a planter or jar with moist topsoil or potting soil.
4. Bury the materials under the soil inside the planter.
5. Keep the soil a little moist (not too much) and in sunlight.
6. After one month, dig out your samples.

Introduction

We see the terms 'biodegradable' and 'compostable' on various products nowadays, from shampoos to disposable cutlery. As consumers grow increasingly aware of the environmental cost of disposable products, many people are opting for these more sustainable alternatives. We can now find products such as biodegradable or compostable beverage containers, shopping bags, diapers, or even make up. What's the difference between these labels and why does it matter?

Biodegradable vs Compostable

If a substance is biodegradable, it means that it can be broken down and decomposed by microorganisms in the environment naturally. Most plastics, for example, are not biodegradable, as most fungi and bacteria lack the enzymes that can digest the molecules that plastic is made of. Common biodegradable products are

wood-based, like paper or cardboard. These can break down naturally in the environment in around 6-8 months. However, depending on the composition of the material, some pollutants may also be broken down with it. Just because some materials are no longer visible in the environment after some time, does not mean that all of the compounds that it is composed of are naturally occurring in an ecosystem. Most products are made of additional substances that may be harmful in the environment. Printed paper may carry trace amounts of chemical solvents that are not naturally occurring in the environment. Particle boards or plywood have resins that hold together the various components, and these are often petroleum-based. Makeup or shampoos sometimes contain formaldehyde as a preservative, but is a known carcinogen. Being biodegradable is certainly helpful, however we have to be mindful of the trace molecules that are being left behind.



Compostable materials are all by nature biodegradable, but they take it a step further. All compostable products that break down become organic rich fertilizer for plant life. This substance is often called humus. If a substance is compostable, then decomposers in the soil will break it down to its basic components and all of it

will be used to grow new plant life. Some people keep their own compost bins to create fertilizer. This is because as earthworms, fungi and bacteria in the soil break down old food scraps, they return those nutrients to the soil and it gives plants basic compounds that they need to undergo photosynthesis. There will be no toxins, pollutants, or unusable matter leftover. This results in a zero-waste, sustainable model that benefits the environment.



Is mycelium biodegradable?

Experiments can be conducted that observe the length of time a material takes to break down and be no longer visible in the environment. You can also test the time it takes for a material to fully assimilate into other organisms in the environment, but this is more difficult to measure. Using your pre-prepared samples, carry out your data collection of the biodegradation of each material.

Materials

- Prepared samples from the Pre-Module task.
- Spade
- Clear transparency sheet
- Markers

Procedure

1. Dig up the samples of various materials placed in soil one month ago.
2. Draw 10 x 10 mm squares on a clear transparency sheet.
3. Place it over each sample and with a marker, mark the number of squares that have been affected visually after the 2 weeks. These could be areas that have disintegrated or have had a change in texture or color.
4. Create a data table such as the one below in order to record results.

Table 1: Number (#) of visually affected 10 x 10mm squares of 80 mm ² piece of material.

Material type	Number (#) of visually affected 10 x 10mm squares, out of 64 total

- Rank your materials in order of the least biodegradation to the most biodegradation. What can you conclude from your results?

Is mycelium compostable?

- One way you can determine if a material is compostable is by looking at the compounds it is composed of. From what materials are the mycelium planters made out of? Are any of these compounds something that is synthetic (human-made), or contains compounds or elements that are toxic to living organisms?
- Based on your findings, can you conclude if mycelium composite is compostable or not?

Show what you know

What have you learned about the similarities and differences of biodegradable and compostable materials? Assign *materials* or *explanations* to their respective positions along the Venn diagram below.

Biodegradable

Compostable

