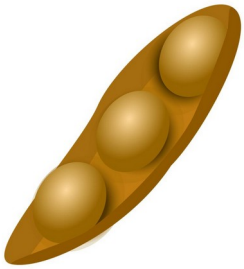
New Jersey Agriculture in the Classroom

Making Plastic From Soybeans

OVERVIEW: So many things are made from soybeans, even plastic! Prove this to your students by showing them how to make plastic from soy oil and cornstarch. Discuss how this type of renewable resource benefits everyone.

GRADES: 3-5



OBJECTIVES: The student will be able to:

- Describe an environmental reason for using soybeans as a source for the production of plastics
- Explain the difference between a nonrenewable resource (plastic from oil) and a renewable resource (plastic from soybeans)
- Make a sample of plastic from soy oil and cornstarch

VOCABULARY

renewable resource: a natural material that can be replenished. This means the resource can be easily replaced after we use them. Plants, wind, and sunlight are all renewable resources.

non-renewable resource: a natural material from the Earth that exists in limited supply and cannot be replaced.

biodegradable: something that can break down, rot, and naturally disappear into the soil.

INTRODUCTION:

Explain that soybeans are a *renewable* resource. Farmers can always grow more soybeans.

Explain that plastics are usually made from oil products. These types of plastic are non-renewable. There is a limited supply of oil on Earth, and that supply will eventually run out. When it does, we can't make more oil. Scientists believe it takes millions of years for oil to form underground. Oil is a non-renewable resource, and we are using oil much faster than new oil can be created.

To help lessen this problem, researchers have invented biodegradable plastics made from plants like soy and corn. New crops can be grown every year. Already, there are more than 1,000 different uses for soy in products.

Another benefit of plastic made from soy is that it is *biodegradable.* When something is biodegradable, tiny living things like bacteria and fungi can eat it and turn it back into simple, healthy soil. This is nature's recycling system, also known as decomposition. Only things that were once alive can be easily broken down by the microscopic bacteria and fungi, which are known as decomposers. When plastics made from soy are no longer needed, instead of being thrown away and dumped in a landfill, they can be composted, where they will decompose back into the soil.

Plastics made from non-renewable oil products last for thousands of years in our environment because they do not break down or decompose. These plastics take up a lot of space in our landfills.

At industrial composting facilities under the right conditions, plastics made from soy or corn will decompose in a few months. If you put the biodegradable plastic in a compost bin in your yard, it would take one to three years to decompose naturally.

Explain that today, students will make a simple biodegradable plastic using nothing but soy oil, cornstarch, and water.

MATERIALS: (for 30 students)

- 2 cups of cornstarch
- 2 cups water
- Measuring tablespoons
- Food coloring of various colors
- ¼ cup soy oil
- 30 resealable baggies
- Measuring 1/4 teaspoons
- Microwave

Procedure for Making Biodegradable Plastic:

Each student mixes 2 tablespoons of cornstarch, 2 tablespoons of water, and 1/4 teaspoon of soy oil in a resealable baggie.

Add 2 drops of food coloring to the mixture. *NOTE: Food coloring will stain clothing, so ask students to roll up their sleeves, wear smocks, or assist young students.*

Tell students to seal the bag tightly and knead the contents carefully until they are mixed well and no cornstarch lumps are seen.

Heat the baggies in a microwave for 30 seconds at a high setting.

NOTE: Do not microwave all the baggies at the same time; they will not become hot enough. Only microwave three or four baggies at a time. You may have to experiment with this number depending on the strength of the microwave.

The bags will be extremely hot! Remove them using oven mitts and let them cool completely before giving them back to students.

Give students the opportunity to create shapes with the biodegradable plastic.

Ask students if anything about the experiment surprised them. Ask them to compare this biodegradable substance to other plastics.

EVALUATION:

Students write a paragraph describing the results of the plastic-making experiment and explaining why it is important to find other forms of materials and fuel instead of depending on oil.

EXTENSIONS

Connect the use of biodegradable plastics and other renewable resources to the efforts to combat climate change by teaching the NJAITC lesson *The Greenhouse Effect,* available to download under Teaching Resources, Climate Change, at *newjersey.agclassroom.org.*

Teach your students more about the decomposition process with the NJAITC lesson *Decomposition: How Nature Recycles*, under Teaching Resources, Basic Gardening, at *newjersey.agclassroom.org.*

New Jersey Learning Standards

Science: 3-LS1B 4:LS1.A 4-ESS3A 5:LS2A 5:LS2B 5:ESS3.C

Social Studies Grades 3-5: 6.1.5.EconEM.1, 2 3-3-5.1.5.EconGE.2 6.1.5.GeoHE.2 6.1.5.EconNE.4

English Language Arts: 3:W.3.2.A-D 4:W.4.2.A-E 5: W.5.2.A-E

Climate Change 3-5: 4-ESSC-1 4-ESSC3-2 5-LS2-1