

Agriculture in soap: Plant oils matter

You use soap everyday. Where does it come from? What are the ingredients?

Skill Level

Intermediate

Age 11-13

Learner Outcomes

- Discover that plant oils have different fatty acids
- Realize that hobby soap makers deal with the same hydrogenated/ non-hydrogenated oils and fatty acids that biotechnologists do

Science

- Build/construct
- Compare/contrast
- Invent/implement solution

Life

- Acquire and evaluate information
- Think creatively

Educational Standard

- Properties and changes of properties in matter
- Science as a human endeavor

Success Indicator

- Make melt-and-pour soaps, testing different ingredients
- Describe the results in terms of properties of the ingredients

Soap made from soybeans?

Sunflowers? Olives? Plant oils have different “fatty acids” that determine the characteristics of your soap -- is it creamy? bubbly? hard? soft? It is the oil in plants that makes different kinds of soap. Try this easy, melt-and-pour soap recipe to get started.

Do . . .

- 1. Gather these materials:** a pyrex measuring cup with a spout, plastic wrap, microwave, stir stick, a mold (special soap molds, wooden box, pvc pipe, etc.), glycerin* soap base (found at craft stores; sold in bars, shredded or flakes, 1-5 pounds).
Optional: fragrance oils, soap color or food coloring.
- 2.** Put a small amount of soap base into the pyrex measuring cup. Cover with plastic wrap. Consider the size of your mold when you choose the amount of soap base.
- 3.** Microwave for one minute and stir until liquid. If the soap base is not liquid, microwave for one minute at a time until your soap is ready to pour.
- 4. Optional:** add 1-2 drops of fragrance oils made from plants: peppermint, lavender, vanilla. Add 1-2 drops food coloring or color chips. Stir.
- 5.** Pour into mold(s).
- 6.** Set the molds in the refrigerator or somewhere they will not be disturbed. Depending on the humidity, your soap can be solid in three hours. If you have trouble removing it from the mold, put it in the freezer for 30 minutes. If you want to make soaps with more than one color, fill the mold halfway, freeze it, add the second color and freeze again.
- 7.** Test your soap. Does it clean your hands? Look good? Smell good? What would you do differently if you tried it again? Go to the Observation Log to record.

*Check the ingredient label. Glycerin should be listed first or second. If you choose coconut soap base, your bar will be heavier and not transparent.



Learn More extension

- History and chemistry of soap
- Making soap in a slow cooker

Virtual Fun extension

- Soap Queen TV - a series
- Olive oil soap

News & Careers extension

- Careers in fats and oils
- No soap No water
- High Oleic Bio-based Industrial Applications



Name _____

Date _____



Records—Intermediate Level
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Share . . .

Describe your soap making recipe and process.

What could you change to improve results?

Reflect . . .

What part does the “oil” play in your soap?

Generalize . . .

Oils also play an important role in foods. Check ingredient labels on foods around your house. What do you find out about oil?

Apply . . .

How could plant scientists work to “improve” oils in soap?



Sunflowers

More Challenges

- Match the color and fragrance and give your soap a name (i.e., pink color, peppermint fragrance, called "Candy" soap.)
- Research the soap making process using sodium hydroxide(lye). Compare what you did to the way pioneers made soap using animal fat and lye.
- Check out ingredient labels on soap products in your house. What did you find?



Sunflowers are one of the many plants that produce an oil used in soap making. Sunflowers contain from 39 to 49 percent oil in the seed. Sunflower oil, extracted from the seeds, is a healthy, premium cooking oil with good flavor. The price of sunflower oil prohibits its widespread use in industrial applications, but it has been used for products such soaps and detergents.

The sunflower head is not a single flower as the name implies. Rather, it's made up of up to 2,000 individual flowers. Did you know that sunflowers are also used to extract toxic ingredients, such as lead, arsenic and uranium from soil?

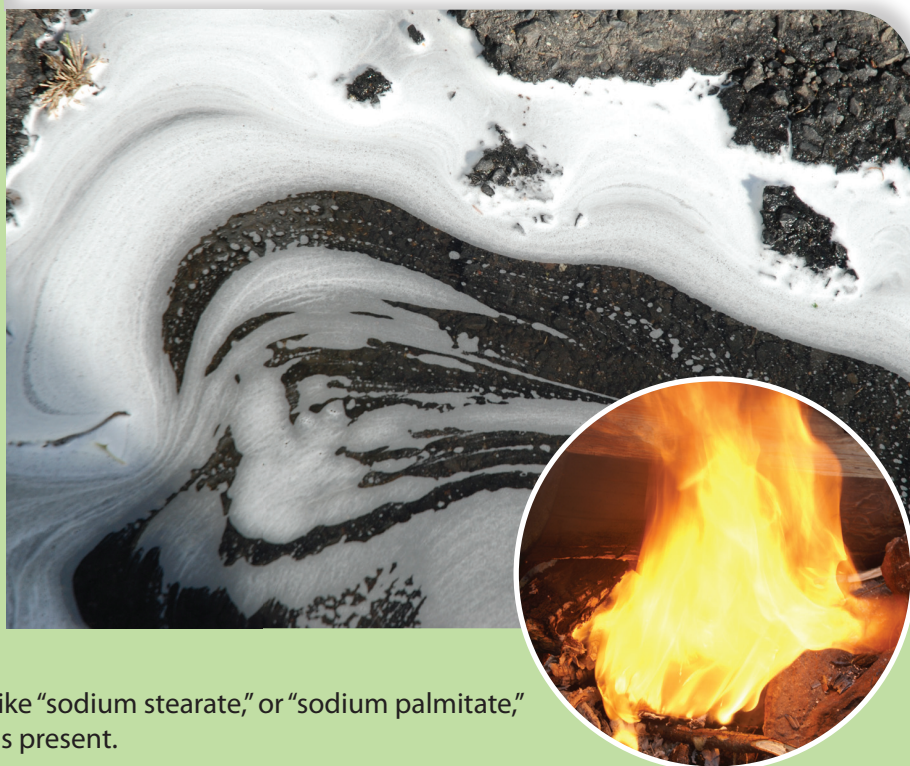


Background Information

Who discovered soap?

Soap properties were discovered 3,000 years ago by the Romans. Animal fat had dripped down into the ashes of a cooking fire and that mixture dripped into a river where clothes were washed. People noticed that this fatty-ashy mixture cleaned clothes better than plain water.

The science in this story is that the animal fat contained fatty acids and glycerine (triglycerides). The ashes contained a type of salt (a base known as alkali). When combined, the triglycerides and alkalis made soap. Today, the long names on the list of ingredients on a soap package, like “sodium stearate,” or “sodium palmitate,” are the names of the specific fatty acids present.



What are plant oils and fatty acids?



Instead of animal fats, plant oils are the source of the triglycerides in our soap. While biochemists work on the chemistry to make better soap, biotechnologists continue to develop plant traits that produce improved fatty acids for soaps and foods and other industrial products. Some of the terms you will see related to the chemistry of fatty acids in soaps and foods are linoleic and linolenic acids, hydrogenated and non-hydrogenated oils, and you might wonder about glycerine.

Glycerin is part of the chemical make up of plant and animal fats. In traditional soap making, when lye was added to the fat, glycerin was released as a byproduct. Glycerin is a colorless compound known for its moisturizing properties. Some commercial soap makers today take the glycerin out of the soap oils to use in lotions that they can sell for a higher price than soap.

Linolenic and **linoleic acids** are two essential fatty acids found in plant and animal oils that humans must ingest for good health. The two fatty acids have also become very popular in beauty products because of their beneficial conditioning and moisturizing properties on the skin.

Hydrogenated refers to oil that has had hydrogen gas forced into it at high pressure. This causes the oil to become more solid. Food examples of hydrogenated oils include Crisco and margarine. The process of hydrogenation makes the fatty acids more stable, have a longer shelf life, but unfortunately less healthy to consume. Hydrogenated oils are what we call trans fats.

Both hydrogenated and non-hydrogenated oils can be used in soap making. Soaps made with solid, hydrogenated oils are harder than the non-hydrogenated oils. Liquid soap made with non-hydrogenated oils offers better conditioning properties but a bit less lather.

Name _____

Date _____



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Observation Log

Making Glycerine Soap

What were the results?

Describe your soap in three categories: look, scent and hand feel.

Look	Scent	Hand feel

Place a photo or illustration here.

Make soap again. Be creative. What soap characteristics did you want change?

How did you adjust the recipe? Include photos or illustrations of your results.

