



Agriculture in Print: Soy Ink

How can a soybean be used to make ink? Why is soy ink good for the environment?

Minimum Completion Time
45 minutes

Skill Level
Intermediate
Age 11-13

Learner Outcomes

- Recognizes that properties of agricultural crops make them sustainable substitutes in industrial products
- Tests the properties of soy oil and soy lecithin in making ink

Science Skills

- Build/construct
- Compare/contrast
- Observe
- Predict

Life Skills

- Think creatively
- Reason

Educational Standards

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

Success Indicator

- Uses materials creatively
- Prints with different kinds of inks
- Describes the outcome process
- Describes the outcome process

Acknowledgements:

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Content adapted from DuPont (www2.dupont.com) and Pioneer (www.pioneer.com) web pages.

Ink is basically pigment mixed in a solution that will not blur when put on paper. Inks made with soybean oil are made from a renewable resource, are much more biodegradable, and print with brighter colors that don't rub off.

Do

What are the ingredients in ink? How do they work? Create your own ink and test your result.

• • • • • Make soy ink

- 1. Gather these materials:** 3 oz. plastic cup, paper towel, 1/8 teaspoon soybean (vegetable) oil, 1/8 teaspoon granular lecithin (found in health food stores); 1 teaspoon unsweetened powdered drink (like Kool-Aid), 1 teaspoon water, stir stick, paper for printing, rubber stamp.
- 2.** Using a stir stick, blend one teaspoon of water with a packet of unsweetened powdered drink mix in a clear 3 oz. cup.
- 3.** Add 1/8 teaspoon of soybean oil to the cup and stir well.
- 4.** Add 1/8 teaspoon of granular soy lecithin to the cup and continue stirring until the lumps are gone.

Note that soy oil does not mix well with water until lecithin is added. Soy lecithin (less-a-thin) is used for mixing fats and oils with water. Lecithin is a common ingredient in fatty foods such as chocolate candy and salad dressing. Check out the label on a chocolate bar or a bottle of creamy Italian dressing.



Learn More

- What is the difference between ink and paint?
- What is soy toner?
- Automotive paint

Virtual Fun

- Inside a printing facility
- Screen printing with soy ink
- Soy crayons

News & Careers

- Agrichemist
- Printer
- Nature and science together

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••••• Prepare for printing

5. Take a paper towel and fold it in half, then in half again.
6. Pour the contents of your soy ink into the center of the paper towel. The soy ink is quickly absorbed.
7. Use a rubber stamp to print images on paper or stationary. Let dry.

What happens when you scratch the dry ink?

What can you do to make the color brighter? The ink dry faster?

Note: Ink can stain fabrics and skin!



Glossary

ink—liquid that contains pigments or dyes used to color a surface to produce an image or text or design.

pigment - a substance that is added to give something such as paint or ink its color.

resins - a semisolid substance used in varnishes, paints, adhesives, inks, and medicines.

solvent—a liquid capable of dissolving substances.

surfactant – a substance that reduces the surface tension of a liquid

toner—a powder used in laser printers and photocopiers to form the printed text and images on the paper.

wax - a moldable substance of animal, plant, or mineral origin that feels slightly greasy or oily to the touch.



Do you know how ink “dries”? Pigments are mixed into water-based and other organic solvents. When the liquid in the ink evaporates, only the pigments that were once dissolved in the liquid remain. Can you think of examples where slower drying times or faster drying times make a difference?

More Challenges

- Answer these questions: What problems were agriscientists and engineers trying to solve when they tested soy ink? Why do newspapers choose soy ink? Why do readers like newspapers printed with soy ink?
- Research and experiment with soy crayons. Compare the process of making soy crayons with soy ink. Test soy crayons and compare them to petroleum-based crayons. Design a survey to see which crayons your friends prefer.

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Name _____

Date _____



Records—Intermediate Level
Agriculture in Print: Soy Ink

Share . . .

What happened when you added oil to the liquid?
How did lecithin change the mixture?

Compare your ink in terms of consistency and color and how it reacted on the paper.

Reflect . . .

What did you know about ink and printing before you made your ink? What did you learn?

Generalize . . .

What benefits can you list for a product like soy ink?

Apply . . .

How can you reduce your dependence on non-renewable resources and products?

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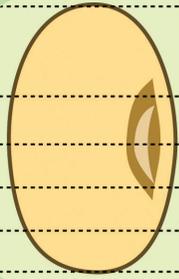


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Background Information

What is in a soybean?



- 40% protein
- 20% oil
- 15% carbohydrates
- 15% dietary fibre (insoluble carbohydrates)
- 10% moisture, ash, other

What part of the soybean is used to print 90% of the nation's daily newspapers?

When processed, soybeans produce about twenty percent oil and forty percent protein. One of the best protein sources, soybeans nourish the people and animals of the world. Biotechnology helps scientists apply what they know about crops to enhance the food we eat and the products we use to make households safer, communities healthier, and the environment more sustainable.

After soybeans are harvested, they are cleaned, cracked and de-hulled. The soybean oil is separated from the soy protein (soybean meal). Soybean oil is then refined for margarine, salad dressings, plus hundreds of consumer products. The newspaper that arrives at your door each morning is printed with soy ink. The foam insulation and carpet backing in your home could be made from soy plastic. The elevators taking visitors to the top of the Statue of Liberty rely on a soy hydraulic fluid. Whether it's candles, cleaners, crayons, cosmetics, concrete sealers, engine oil, fuel, industrial lubricants, paints, roof coatings or varnishes, soybeans create natural, renewable products.

To make soy ink, soybean oil is slightly refined and then blended with **pigment, resins** and **waxes**. Soybean oil is naturally clearer than petroleum oils, making it easier to obtain brightly colored ink. Since the oil is clearer, less pigment is necessary to produce the same effect. In addition to a brighter ink, printers report that they need less ink to print the same amount of paper when compared to petroleum inks.



Soy ink has been found to spread approximately 15% further, reducing ink use and printer cleanup costs.

While environmentally friendly soy ink has been used by newspapers for years, soy toner is now available for laser printers and fax machines. Soy toner is being used in many schools and offices today. The toner in most printer cartridges has been petroleum based. About two liters of petroleum oil yield one pound of toner powder, and Volatile Organic Compounds (VOCs) are released in the process. What can you find out about VOCs and its effect on the environment?

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