

From Sauce to Solid: The Science of Cranberry Sauces Lab

Lab: 24 points; Lab Report: 22 points possible

Purpose:

Jellied cranberries are thick, like gelatin, and retain the shape of the mold in which it was placed. Cranberries can be served as a solid (think of the jellied can version) but may also be served as a sauce. Both versions use the same exact ingredients, so what makes one version turn into a gelatin while the other stays saucy? The objective of this lab will be to determine how cooking time affects the ability of the natural pectin in cranberry sauce to form a solid gelatin.

Adapted from:

"From Sauce to Solid: The Science of Cranberry Condiments." *Science Buddies*,

www.sciencebuddies.org/science-fair-projects/project-ideas/FoodSci_p061/cooking-food-science/cranberry-sauce#background.

Safety:

- Use pot holders or oven mitts when touching hot items/equipment.

Equipment:	Ingredients: Day 1
Day 1 <ul style="list-style-type: none">• Colander• Scale• Liquid measuring cup• Large saucepan• Heat resistant rubber scraper• Stove• Candy thermometer• Watch or timer• Ladle• Ramekins or other small, heat-resistant containers (5)<ul style="list-style-type: none">◦ Should hold at least 4 oz. (1/2 cup) of liquid◦ All five should be the same size and shape Day 2 <ul style="list-style-type: none">• Butter knife• Small dessert plates (5)• Masking tape/writing utensil	<ul style="list-style-type: none">• 12 oz bag of fresh or frozen (thawed) whole cranberries• 8 fl oz water (1 c)• 7.1 oz granulated sugar (1 c)

Procedure:

Day 1

1. Using the masking tape and pen, label the ramekins (or other small, heat-resistant containers) as follows: **3 minutes, 6 minutes, 9 minutes, 12 minutes, and 15 minutes.**
2. Pour the cranberries into the colander. Rinse the cranberries, throw away any that are squishy rather than firm, drain thoroughly, and set them aside.
3. Add the measured 1 c water and 1 c granulated sugar to the large saucepan and place on medium-high heat; stir until the sugar is dissolved.

Note: If the candy thermometer has a clip, attach the thermometer to the side of the saucepan. If not, set aside the thermometer until later.

4. Add the cranberries and stir occasionally. After a couple of minutes, you will hear and see the cranberries popping open.
5. **Keep stirring until you can count slowly to five without hearing another cranberry pop open.** Use the candy thermometer to determine the temperature of the cranberry mixture. If the temperature is below 100°C, continue stirring and monitoring the temperature. **From this point on, the cranberry mixture will need to be stirred almost continuously.**
Note: Depending on your stove, you may need to turn the heat up to high in order to reach the 100°C mark.
6. **Once the temperature of the cranberry mixture reaches 100°C, start timing.** After 3 minutes, use a ladle to fill a ½ c measuring cup of cranberry mixture and carefully pour it in a ramekin labeled 3 minutes.
 - a. Mark down your observations of the consistency of the sauce and the appearance of the cranberries in the [lab report](#) (i.e. Are they mostly whole? Completely unrecognizable from the rest of the sauce? Somewhere in between?)
 - b. Continue stirring and timing the cranberry mixture, **removing ½ c of sauce every 3 minutes** and placing it in the corresponding ramekin. **The last sample should be removed at the 15-minute mark.** Continue to mark your observations for each sample in the lab report.
7. Let the samples cool completely at room temperature. **Be sure to have all samples on one tray with your kitchen number with the labeled ramekins/custard cups.**
8. Samples will be refrigerated until the following class.

Day 2

1. Compare the color of all five cranberry samples. Write your observations down in your lab report's data table.
2. Unmold each cranberry sauce sample onto a fresh plate, starting with the *3-minute* sample, as follows:
 - a. Gently loosen the cranberry sauce sample from the ramekin by running a butter knife along the inside edges of the ramekin/custard-cup.
 - b. Put the plate face-down on top of the ramekin and then simultaneously flip over the ramekin and the plate. The plate should now be right-side-up, and the ramekin should be upside-down. The cranberry sauce should easily slip out of the ramekin, as shown in the picture below. If it does not, try carefully loosening the sample more using the butter knife.



3. Mark down in your data table which cranberry sauce samples retain the molded shape of the ramekins. Also observe how firm the cranberry sauce is. Is there a relationship between the amount of time the cranberries spent cooking at 100°C and the cranberry sauce's ability to create a stable gel?
4. Compare the consistency of the five cooled cranberry sauce samples. Are the samples that can not hold a shape all identical in their consistency? How about the ones that can hold a shape? Record responses in the data table.
5. Repeat using each variation.
6. Answer the questions following the data table.

From Sauce to Solid: The Science of Cranberry Sauces Lab Report

Best completed in Google Docs

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Name:

Pre-Lab

Purpose: 1 pt

Procedure Summary: 1 pt

Lab

Data 12.5 pt

Sample	Day 1		Day 2		
	Consistency While Hot	Appearance of Cranberries	Color	Does It Hold a Shape?	Consistency When Cooled
3 minutes					
6 minutes					
9 minutes					
12 minutes					
15 minutes					

Post-Lab Questions

Use the lab data and information [found here](#) to answer the questions below.

1. Where does pectin come from? *1 pt*
2. How does pectin help form a solid jelly? *1 pt*
3. What role do sugar and water play in making cranberry sauce? *1 pt*
4. What happens to the amount of pectin in the sauce the longer you heat the cranberries? Why? *1.5 pt*
5. To heat the cranberries enough to pop them open, you needed to bring the sugar-water mixture to a boil. During boiling, steam is released. Steam is made of water molecules. Do you think this has any effect on the gelling of the cranberry sauce? Why or why not? *2 pt*
6. In what other applications could pectin be used, either as a natural form of the fruit or as an added ingredient? *1 pt*