

# What impacts sugar crystal growth

Kindergarten

## Testable Questions:

How does the amount of sugar in water affect sugar crystal growth?

Does the addition of mint flavoring change the speed of sugar crystal growth?

## Predictions:

I think higher amounts of sugar will grow crystals slower than low amounts of sugar.

I think adding mint will grow crystals faster than without mint because flavored rock candy tastes better.

# Procedure:

1. Boil at least 2 cups of water
2. Cut 6 strings to 8" long
3. Tie one end of each string to a paper clip and the other end of the string to a straw or something that will reach across the top of the cups.
4. Label the cups with the sugar to water ratio and any other variables
5. Add the food coloring to the bottom of each cup
6. Add mint extract to the + mint cups
7. Measure sugar and add to the cups (see table to the right)
8. Stir 4 Tbsp (1/4 cup) hot water into each cup until sugar is fully dissolved
9. Put strings and paperclips into the cups
10. Take pictures
11. Move cups to a place they can be left alone for at least one week
12. Record data regularly

Cup label	2.5:1	2.0:1	1.5:1	2.5:1 + mint	2.0:1 + mint	1.5:1 + mint
Sugar (Tbsp)	10	8	6	10	8	6
Water (Tbsp)	4	4	4	4	4	4
Red food coloring	2 drops	2 drops	2 drops	2 drops	2 drops	2 drops
Mint extract	0 drops	0 drops	0 drops	2 drops	2 drops	2 drops

# Background:

I chose this project because I like to eat sugar crystals and I wanted to learn how they are made.

In my research I found out that crystallized sugar sinks to the bottom and dissolves in water. They dissolve faster when the water is hot. As more sugar is added to the water, the volume of the water increases. The water color also turns yellow or light brown as more sugar is added. The water became thicker like maple syrup. The sugar also dissolved more slowly as more sugar was added to the water.

This project is important because candy is yummy and understanding how to make it will help me make new kinds of candy to make people happy.



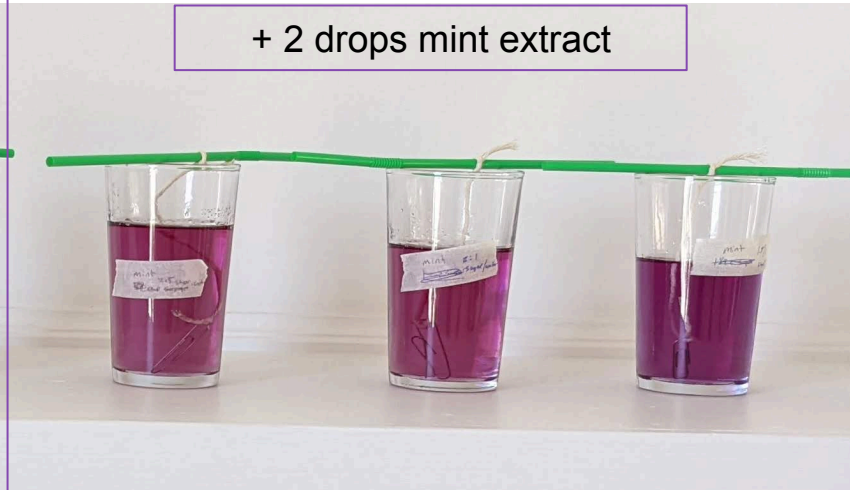
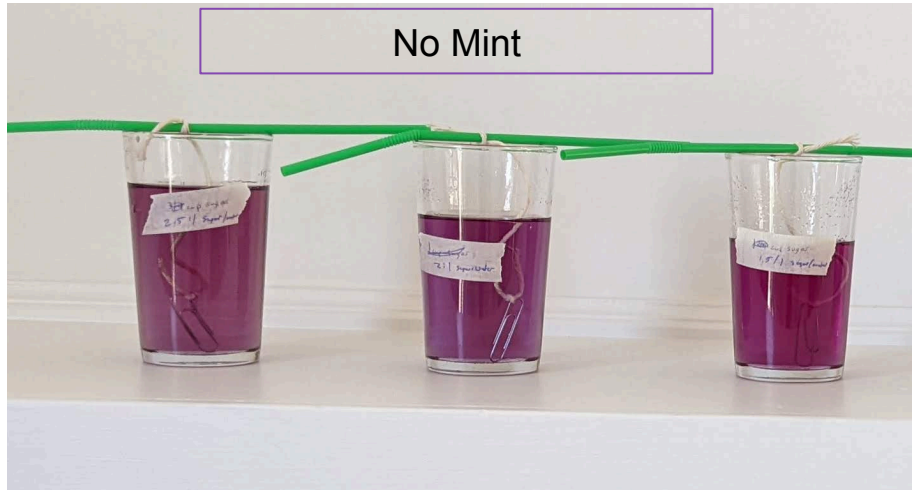
# Constant Conditions:

**Independent Variable:** The amount of sugar. We also separately tested mint flavoring extract.

**Dependent Variable:** Sugar crystal formation

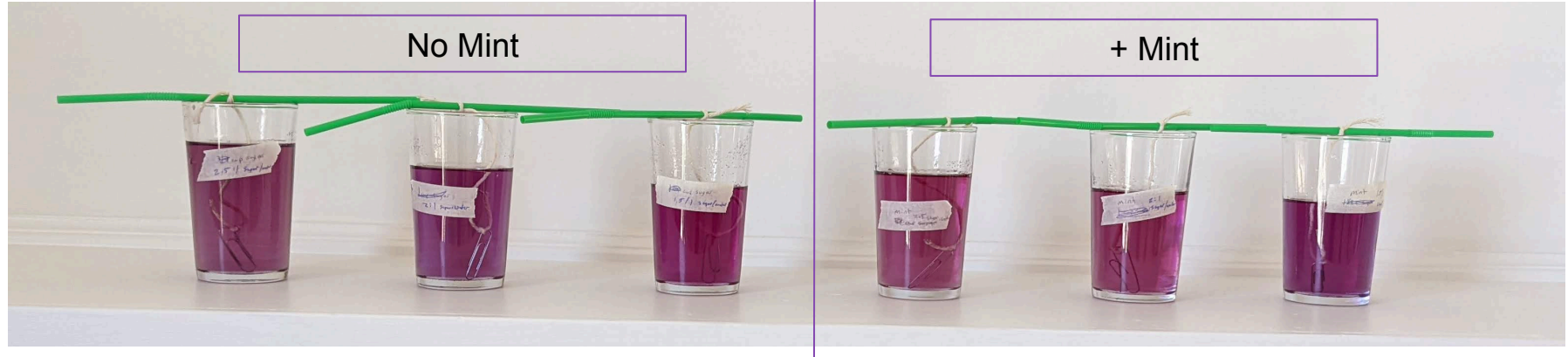
**Constant Conditions:** The amount of water, all water was the same temperature to start, same string and paper clip, same cups, same amount food coloring, same amount of mint extract, same shelf & conditions after setting up the tests

# Data and Trials: Day 0



Sugar :Water Ratio	2.5:1	2.0:1	1.5:1	2.5:1	2.0:1	1.5:1
Sugar (Tbsp)	10	8	6	10	8	6
Water (Tbsp)	4	4	4	4	4	4
Red food coloring	2 drops	2 drops	2 drops	2 drops	2 drops	2 drops

# Data and Trials: Day 0 - observations



I observed that all the liquids were clear and that all sugar was dissolved. The red food coloring we used turned purple. The volume of liquid in the cups increased as the amount of sugar added to each cup increased. There were no observable differences, other than smell, between the mint and no mint. All cups looked the same when we started.

# Data and Trials: Day 1 - observations

Figure 1: Close up view of 2.5:1 ratio + Mint

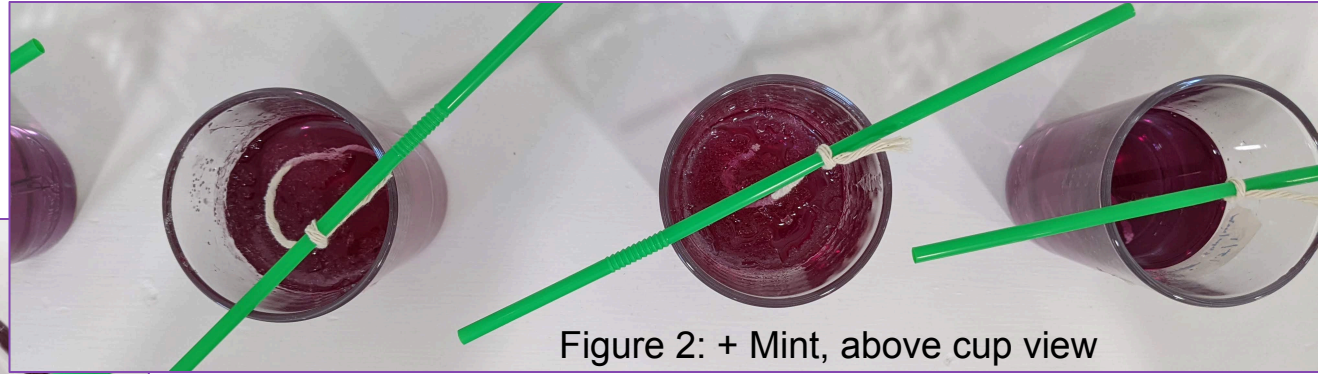


Figure 2: + Mint, above cup view

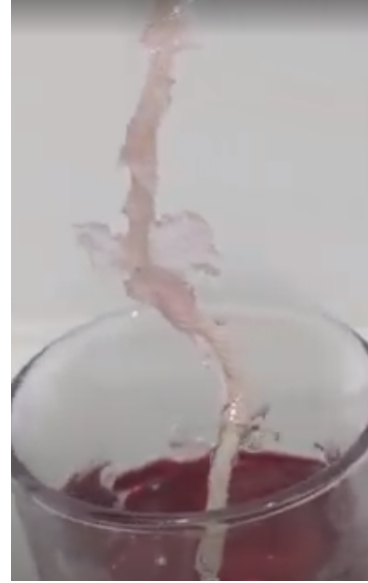
- The strings were starting to turn purple. The strings looked about the same in all cups.
- Crystals were seen at top of the liquid in 3 of the 6 cups. The 2.5:1 with and without mint and the 2:1 with mint. The other 3 had no observable crystals.
- The crystals were across the full top of the liquid, not necessarily attached to the strings.

# Data and Trials: Day 5 - observations

Figure 1: 2.5:1 without mint



Figure 2: 2.5:1 without mint



- This is the first time that I observed crystals forming on the string.
- It is also the first time I observed crystals on the bottom of any of the cups
  - The 2.5:1 without mint and the 2.5:1 and 2:1 with mint had visible crystals attached to the strings and at the bottom of the cups.
  - The other cups did not have any visible crystals.



# Data and Trials: Day 7 - observations

Figure 1: no mint



- The cups that already had crystals forming have even more crystals.
- The cups with no crystals still have no large, visible crystals.

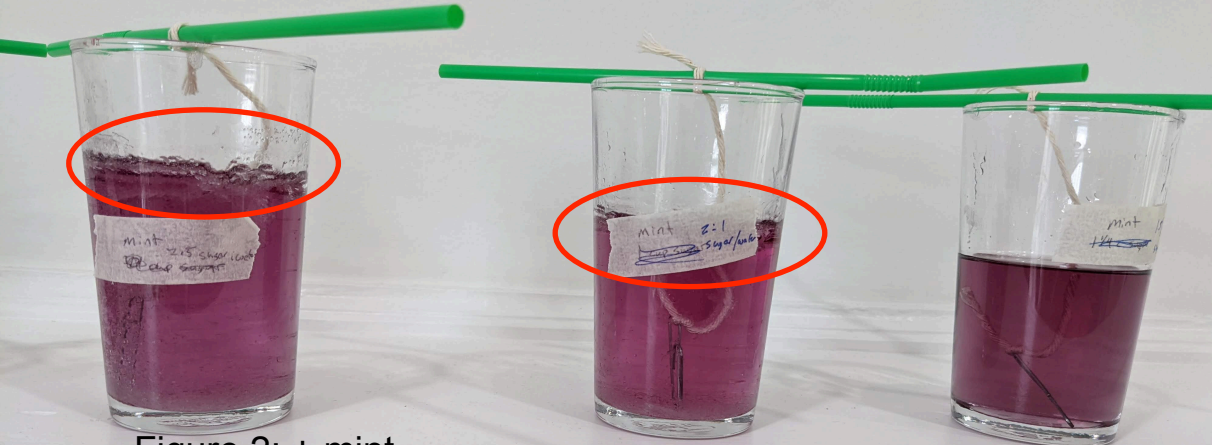


Figure 2: + mint

## Data and Trials: Day 7 – observations – 2.5:1 ratio

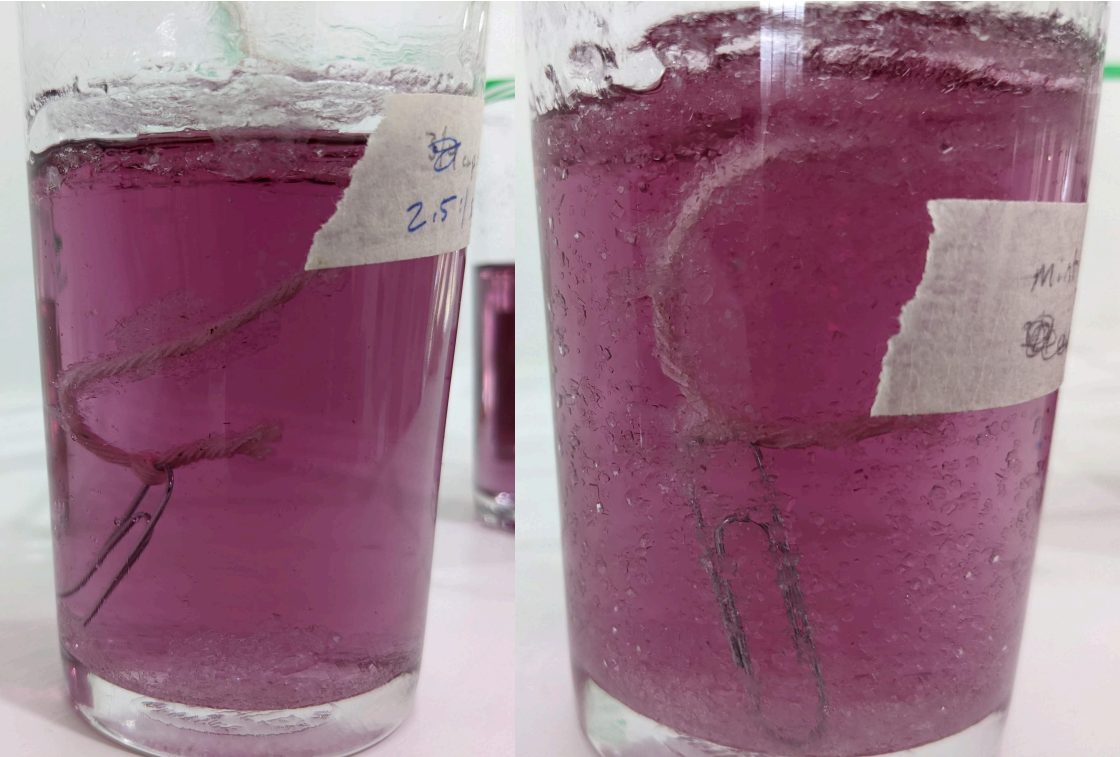


Figure 1: no mint

Figure 2: + mint

- The 2.5:1 with mint appears to have a lot more crystals in the water than the same ratio without mint

## Data and Trials: Day 7 – observations – 2:1 ratio

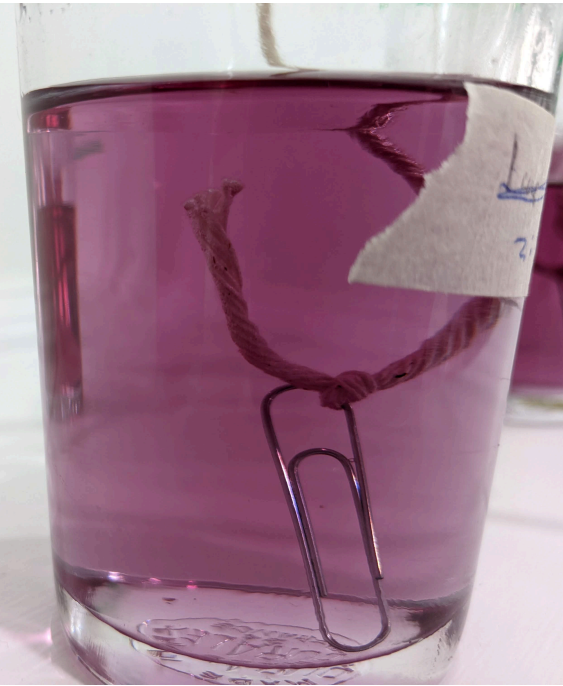


Figure 1: no mint



Figure 2: + mint

- The 2:1 cup with mint has a lot of visible crystals, but the cup without mint does not have as many visible crystals



## Data and Trials: Day 7 – observations – 1.5:1 ratio



Figure 1: no mint

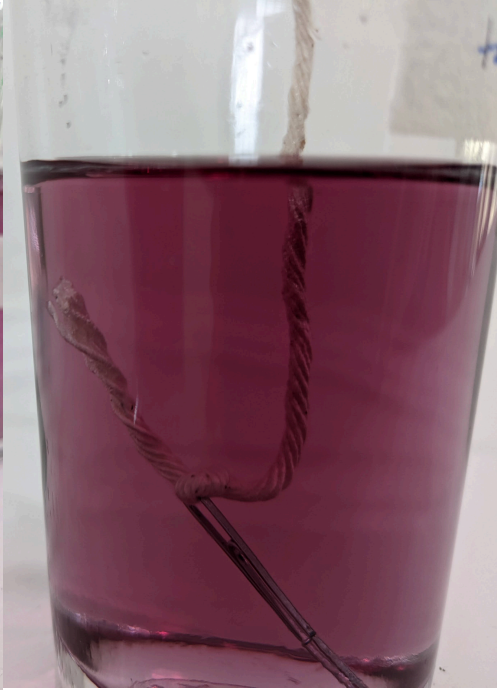


Figure 2: + mint

- Neither of the 1.5:1 cups have any visible crystals growing.

## Data and Trials: Day 7 – observations



Figure 1: 2.5:1 no mint

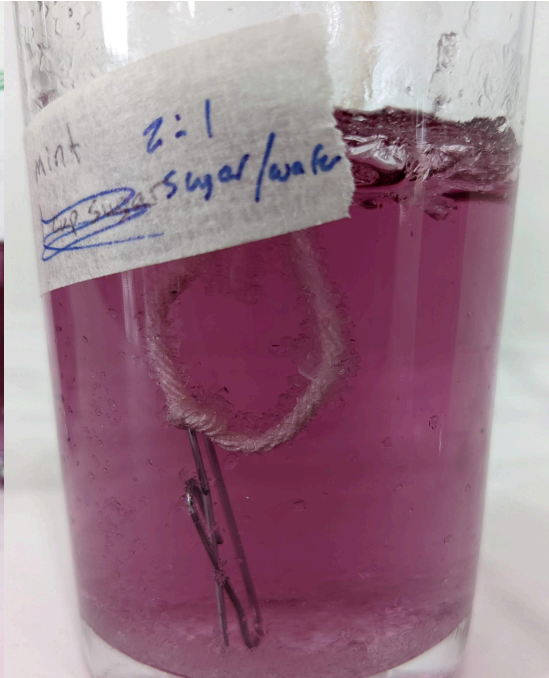


Figure 2: 2.0:1 + mint

- The 2.5:1 with out mint and the 2:1 with mint appear very similar.
- Both cups have noticeable crystal growth on the strings, but also have some crystals forming in the liquid and at the bottom of the cups.

## Conclusion and Reflection:

I found out that making sugar crystals is not fast or easy. I also learned that the addition of mint extract appears to increase the rate of crystal growth, which I predicted. I also found out that sugar crystals grow faster with higher sugar to water ratios. In other words, the more sugar is in the water, the faster the crystals grow. My prediction about higher amounts of sugar slowing down crystal growth was incorrect.

I was surprised that it took so long for crystals to grow and that the crystals I grew were so much smaller than rock candy you can buy. I was also surprised that the crystals grew on the sides of the cup and the top of the liquid. I expected the crystals to only grow on the string. I was also surprised that the red food coloring turned purple. I've noticed it does that when I mix it with other things like milk. I wonder what is similar between them and why the food coloring changes from red to purple.

If I did this project again I would test different flavor extracts to see how they affect crystal growth. Is mint the best one? I would also try increasing the amount of sugar in the water, to try to get faster crystal growth.