

## Science Fair Logbook Grade 8

Oct 26, 2023

<https://web.archive.org/web/20190812161851/https://www.googlesciencefair.com/projects/2018/056075c3255ccc9d9ef035618eadbef4690dd38aac815e4a10419b1c4bfcfbc0>

I read this and found out that persimmons contain a big amount of tannins, which have antibacterial properties. I wanted to see if I could make an antibacterial solution like this using mango peels from under ripe mangoes, because mangoes are more accessible in Calgary compared to persimmons and I found that mangoes also contain tannins. I plan to mix it with melted snow to make the solution because snow is easily accessible to everyone in the winter.

Oct 30, 2023

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7412100/#:~:text=The%20antibacterial%20effectiveness%20of%20tannins,as%20a%20result>

I did some more research on tannins and I found that they have antibacterial properties because they can pass through a bacterial cell wall up to the internal membrane of the bacteria, interfere with the bacteria cell's metabolism which then leads to the bacteria cell being destroyed.

<https://www.scielo.br/j/floram/a/LYhtnvCMCGrWvYHvryM5k9jG/?lang=en> From this website, I learned that sodium sulfite can increase the contact surface between tannins and the solvent (melted snow), and this increases the extraction efficiency. It also said that very high levels of sodium can decrease the amount of tannins extracted, so I'll probably add a low concentration of sodium sulfite to the melted snow to increase the tannin extraction efficiency.

Nov 2, 2023

I got some feedback on my science fair proposal and I decided that this project would work better as an experiment rather than an innovation.

Nov 6, 2023

I decided that I want to test persimmon calyx, mango seeds from under ripe mangoes, and under ripe bananas to see which fruit would prevent the most bacteria from growing and if they would stop bacteria from growing at all.

I decided to test mango peels because I found some information about mango peels having some amounts of tannin from this website:

<https://www.entomoljournal.com/archives/2017/vol5issue4/PartE/5-3-248-119.pdf>

and mango peels are usually thrown away when mangoes are being prepared to be eaten, and if they could be used for an effective antibacterial solution then it could eliminate lots of the waste.

I want to use banana peels because I found that banana peels contain some tannins from this pdf: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9122687/> , and banana peels are usually thrown away when you're eating a banana, so this could also eliminate waste.

I want to test persimmon calyx because someone already did an experiment on the antibacterial properties of persimmon calyx and I want to see if it will work with persimmon calyx that I can get in Calgary. Also, I want to see if it will work better as an antibacterial solution compared to the other fruits. A persimmon calyx is also usually discarded when eating a persimmon so this could be another way to get rid of the waste.

Nov 12, 2023

<https://web.archive.org/web/20190812161851/https://www.google-science-fair.com/projects/2018/056075c3255ccc9d9ef035618eadbef4690dd38aac815e4a10419b1c4bfcfbc0> I read more of this and also read this: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4279630/>

I found that I could test a solution to see if it has tannins by adding FeCl<sub>3</sub> (Iron III Chloride or ferric chloride) FeCl<sub>3</sub> usually has a yellow-orange colour, and in the presence of tannins it turns dark green. I could use this to confirm that the antibacterial solutions have tannins in them.

I also learned that there are different types of tannins (catechol tannins and gallic tannins)

Nov 13, 2023

I decided that I will use pomegranates instead of persimmons because they'll be easier to get. I'll use the peel of the pomegranate because they're usually discarded and they have lots of tannins.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9268770/#:~:text=%5B69%5D%20found%20that%20the%20highest.of%20pomegranate%20extracts%20is%20tannin.>

This article says that the highest amount of tannin content was reported for pomegranate peel extracts, then orange, and then banana. It also says that pomegranate peel powder has a tannic odour because of its high tannin content. I think that it will work the best as an antibacterial solution because of this. It seems to have a higher tannin content compared to bananas and mangoes.

Nov 15, 2023

<https://revues.cirad.fr/index.php/fruits/article/download/36134/34912/38177>

I read this pdf and it says that “the peel of pomegranate contains substantial amounts of polyphenols such as ellagic tannins, ellagic acid and gallic acid.”

<https://sustainablebartender.com/pomegranate-skin-infusions/#:~:text=The%20skin%20is%20EDIBLE%2C%20but,bit%20of%20an%20astringent%20aftertaste.>

- pomegranate peels have a “tannic fruitiness with an astringent aftertaste.

<https://www.healthshots.com/healthy-eating/superfoods/from-cough-to-acne-here-are-5-health-benefits-of-pomegranate-peel/>

- pomegranate peels have a bitter and astringent taste.

<https://www.healthline.com/nutrition/mango-skin#:~:text=Though%20mango%20fruit%20is%20sweet,skin%20may%20turn%20you%20off.>

- mango peels are described to have a bitter taste.

<https://www.tastingtable.com/919873/the-absolute-best-uses-for-banana-peels/>

- banana peels have a subtle banana taste and can also be a bit bitter.

Foods that contain tannin usually taste bitter and astringent, and this indicates that all three fruit peels contain tannin. The taste of the pomegranate peels also indicate that it has more tannin than the other fruit peels, because they're described as both bitter and astringent in multiple websites. The other fruit peels are only described as bitter.

Nov 16, 2023

I could use grid paper and put it under a petri dish and count how many squares that the bacteria colonies touch. (to compare the petri dishes with the antibacterial solutions added to the control petri dish.)

Nov 17, 2023

I started working on my background research.

Nov 20, 2023

<https://www.sciencedirect.com/science/article/pii/S138589472203296X> I read this article and added more information to my background research.

What my data table could look like:

	Test 1	Test 2	Test 3
Pomegranate peel antibacterial solution	__ squares (that bacteria colonies touch)	__ squares	__ squares
Mango peel antibacterial solution	__ squares	__ squares	__ squares
Banana peel antibacterial solution	__ squares	__ squares	__ squares

Nov 22, 2023

I added information to my background research about Gram-positive bacteria, Gram-negative bacteria, and the effectiveness of tannins on them.

Dec 2, 2023

I finished writing my background research.

Dec 4, 2023

I filled out the basic project info on the CYSF website and submitted the ethics due care part to be looked over and approved.

Dec 5, 2023

I wrote my procedure in more detail and I might do my testing this weekend or next weekend.

Dec 6, 2023

The ethics and due care for my project got approved. I also filled out the hypothesis, research, and variables part for my project on the CYSF website.

Dec 10, 2023

I did some tests (not my final testing) with the ferric chloride and the different fruit peels: The colour of the ferric chloride didn't change to black when the mango and banana peels that hadn't been heated were added. The pomegranate peel changed the colour of the ferric chloride to black without it being heated. I'll probably do my actual testing next Sunday.

Dec 12, 2023

I finalized my procedure and updated my materials to say that the mangoes I'm using are green mangoes/under ripe mangoes.

Dec 13, 2023

I filled out more sections on the CYSF website and also added some more information to my background research.

Dec 14, 2023

I created a slideshow for the project and started filling in basic information like my problem, hypothesis, and variables.

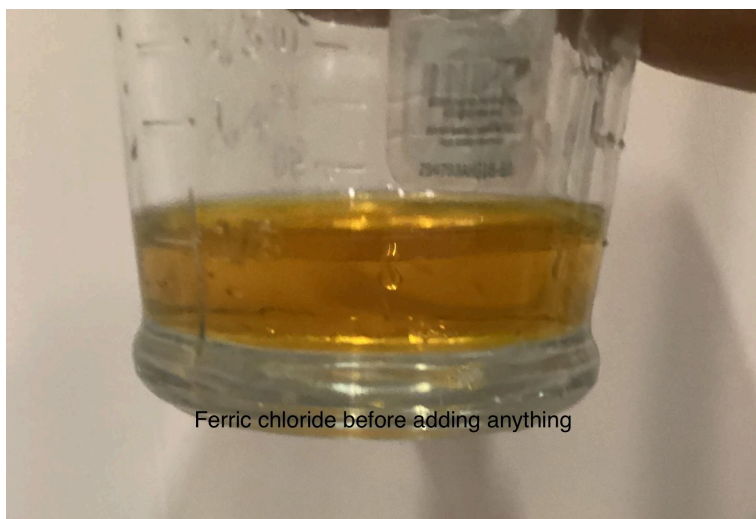
Dec 15, 2023

I added more to my slideshow and I also added more information to my background research related to the properties of tannins/tannic acid

Dec 17, 2023

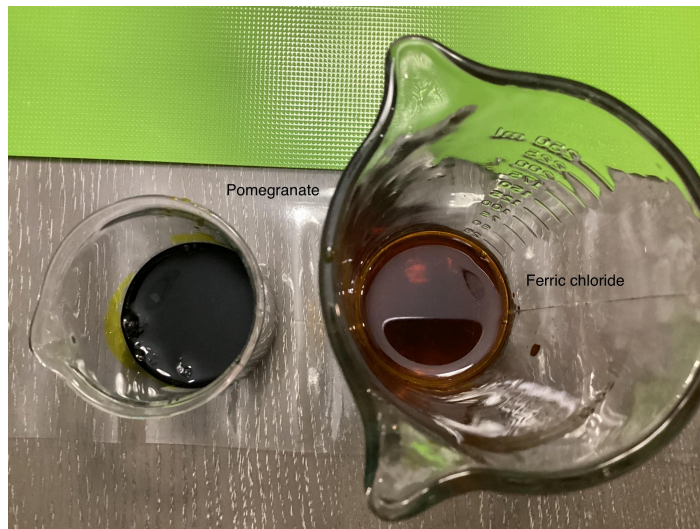
- I did my testing and took a lot of pictures. I have to wait a few days to see the results in the Petri dishes.
- I noticed that the ferric chloride with nothing in it was a darker colour compared to when I opened it and tested it last week with the fruit peels that weren't heated.

Last week:



Ferric chloride before adding anything

This week: (ferric chloride on the right)



- This might be because it was exposed to air or contaminants when I opened it last week?
- However, this didn't affect the ferric chloride turning dark green or black when exposed to tannins because all the fruit peel antibacterial solutions that were heated changed the colour of the ferric chloride to black.
  - If you compare this to the tests I did last week with the fruit peels and water which weren't heated, it shows that heating the fruit peels and water successfully extracts the tannins.
- I also added all the pictures I took into a separate folder in my science fair folder.

Dec 18, 2023

I edited my procedure to contain everything I did during my testing. Since I have to wait for the bacteria to grow in the petri dishes before I can fill out my data table, I continued working on my slideshow/presentation.

Dec 19, 2023

I continued working on my slideshow and I added slides for the materials and procedure.

Dec 20, 2023

I worked on my slideshow some more, and hopefully the bacteria in the petri dishes will grow soon so I can get my results.

Dec 30, 2023

I did my experiment again since there were small lumps in the nutrient agar which made it hard to tell if there were bacteria colonies or just nutrient agar clumps.

Jan 4, 2024

Data:

	Test 1	Test 2	Test 3
Pomegranate peel antibacterial solution	0 squares (that bacteria colonies touch)	0 squares	0 squares
Mango peel antibacterial solution	0 squares	6 squares (that fungi touch)	8 squares (that bacteria and fungi touch)
Banana peel antibacterial solution	5 squares	3 squares	5 squares

Control	247 squares
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- control basically touched all the squares
- grid paper was half a centimetre per square
- mango peel antibacterial solution and banana peel antibacterial solution left a cloudy residue on the nutrient agar.
- pomegranate peel antibacterial solution left a red tint on the nutrient agar.
- mango antibacterial solution test 2 and 3 grew fungi

Jan 13, 2024

I finished making my graph and added it into my slideshow.

Jan 16, 2024

I added a lot of my pictures into my slideshow and made the colours look better.

Jan 17, 2024

I duplicated my slideshow and made one for the in class presentation and the other one to print out for my trifold. (The trifold one has more text so people can understand it without me presenting it to them.)

Jan 19, 2024

I finished writing my analysis and conclusion.

Feb 1, 2024

I forgot to fill out my logbook before, but I finished making my slideshow, presented it in class, and finished making my trifold.

Feb 24, 2024

I got selected to be in the Calgary science fair, and I filled out most of the things on the website today.