

Name: Safaa Asif (8C)

Science Fair - Logbook

Timetable

| | | |
|-------------------------------------|--|--|
| Choose a topic 2020-12-31 | Get approval 2021-01-01 | Plan Experiment 2021-01-03 |
| Plan Variables 2021-01-04 | Background research 2021-01-05-07 | Question/ Hypothesis 2021-01-08 |
| Conduct Experiment 2021-01-09 | Observation 2021-01-10 | Gather Results 2021-01-11 |
| Compare Results 2021-01-12 | Applications & Importance 2021-01-13 | Record Video Any time until 2021-01-23 |

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2020-12-25 to 2021-12-31

Areas of interest:

- ★ Phycology
- ★ Chemistry
- ★ Physics
- ★ Engineering

Project ideas:

- ★ Which solution or fluid can power a light bulb?
https://www.youtube.com/watch?v=t6Ta_r9wT7k
- ★ Mini refrigerator
<https://www.youtube.com/watch?v=8DYSj3cHyIU>
- ★ Testing vitamin C in fruits and vegetables
<https://www.youtube.com/watch?v=fHCcf6ZH4LQ>
- ★ Hydraulic press
<https://www.youtube.com/watch?v=CbGrjhDtLGw&t=20s>
- ★ Water filtration
<https://www.youtube.com/watch?v=60Big9Ut6Mc>
- ★ Water distiller
<https://www.youtube.com/watch?v=ZPeTZvVhWRs>
- ★ Hydraulic brake system vs. pneumatic brake system
<https://www.youtube.com/watch?v=fffoTcLIY1o>
- ★ Making more water from a smaller amount of water.

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2021-01-01

Trucks are made to have pneumatic brakes while smaller vehicles have hydraulic brakes, but why? I wanted to create 2 brakes with different systems and see which one is more effective or safe for which type of vehicle.

I thought that powering a light bulb would be extremely important since it would be energy efficient to power it with a fluid. Comparing which solution works best would help me decide which one should be used more and why.

Even though distillation is a certain type of water filtration, for this method I wanted to see how it worked on its own without comparing it to other processes. I wanted to also test whether it was safe, unsafe, effective, or ineffective by making my own distiller with just bottles.

The hydraulic press was also a great idea because there are a lot of applications for it, such as crushing cans. I was also taught about hydraulics this year, so I would have a better understanding of what I was doing

It is very important for our health that we know what we are eating and what's in our food. Vitamin C deficiency can cause many problems and by performing this experiment we can find which vegetables are have more Vitamin C. This is useful for those who do not believe the news or nutrition fact, they can perform the experiment at home themselves and see which vegetables they should or shouldn't...

The mini refrigerator sounded like a good idea since I could have many applications, such as a mini fridge available in a car would be convenient for a long road trips. I even found a video showing how to make it, so that gave me an idea on how I could make it.

Making water from a small amount of water is really cool and it can be done through a reaction. The reaction can be dangerous, but when countries need water, it could be a useful solution.

I decided that water filtration was a good idea because many countries need clean water and I could demonstrate many ways of filtering water to see which one was best.

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2021-01-02

Topic chosen:

I am a day late in deciding my topic but atleast I gathered some ideas. The ideas are on the first page. From all those, I liked the distilling vs. filtering water. Before I started the experiment though I had to email my teacher to see whether the topic was interesting and at grade level.

That evening...

I emailed my teacher and she replied. She said that this would be below grade level and maybe I could look into other purification methods. I didn't have enough time to research other methods, pick the one I liked, and then experiment with it. That's why I decided to do another topic I was interested in.

This project would require me to get 2 big magnets, copper wire, and a bunch of other materials to charge a phone. This would be really helpful and there would be lots to write about under applications. As always though, if the experiment didn't work, my project wouldn't be much use so I decided to test the experiment before writing about it.

2021-01-03

I went to buy the materials and tested the experiment, neither did it charge a phone, nor did it light the bulb so with only a few days remaining I would have to find another topic.

2021-01-04

Background research:

Firstly, I thought about the experiment and testing different fruits and vegetables wouldn't be very informative since everyone knows either oranges or lemons would have the most vitamin C content. Instead of testing different fruits and veggies, I decided to test the amount of Vitamin C in dark green vegetables and light green vegetables to see which one has more.

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Vitamins:

→ There are 13 vitamins, 4 of them are fat-soluble vitamins, and 9 of them are water-soluble vitamins.

Fat-soluble vitamins

Vitamin A
Vitamin D
Vitamin E
Vitamin K.

Water-soluble vitamins

Vitamin C
Vitamin B1 (thiamine)
Vitamin B2 (riboflavin)
Vitamin B3 (niacin)
Vitamin B5 (pantothenic acid)
Vitamin B6
Vitamin B7 (biotin)
Vitamin B9
Vitamin B12 (cobalamin)

2021-01-05

- Pure vitamin C is a white, crystalline solid that is soluble in water
- Its chemical name is ascorbic acid.
- Ascorbic acid is an organic compound, with the chemical formula of: $C_6H_8O_6$
- Vitamins are an essential need for our body
- When someone thinks of vitamin C, pictures of oranges usually come to mind. This is because vitamin C is abundant in citrus fruits such as oranges, lemons, limes, and grapefruits.
- Lots of vegetables are an excellent source of vitamin C like, broccoli, cabbage, spinach, lettuce, parsley, capicum, beans, and peas.

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2021-01-06

Variables

The variables are as follows:

Controlled Variables

- Amount of iodine indicator solution
- Temperature of indicator solution and of vegetables were kept the same for all 4 vegetables.

Manipulated Variables

- Type of vegetable used

Responding Variable

- Amount of vitamin C present in that vegetable
- How many drops of juice was needed to clear the indicator solution.

2021-01-07

Hypothesis:

Vitamin C is...

- Good source of fibre
- Good source of folate
- Good source of carotenoids.
- These vegetables contain vitamin K
- They contain minerals
- They contain iron
- They contain calcium.
- Dark green vegetables act as antioxidants in the body.
- Materials

Since Vitamin C is beneficial to health in so many ways, I hypothesize that it is also very rich in vitamin C

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2021-01-08

Materials

- Dark green veggies
- Light green veggies
- Iodine
- Cornstarch
- Water
- Pan
- Stove
- Strainer
- Test tubes
- Dropper
- blender

2021-01-09

Procedure

Today, I decided to write down my procedure as well as record it so it would be easier. When I would have to submit the video, I could just edit it and send it. My procedure contains 3 different steps.

Preparing pulp from the vegetables

1. Simply pulp each of the vegetables into the blender
2. Strain and keep the juices

Preparing the iodine indicator solution

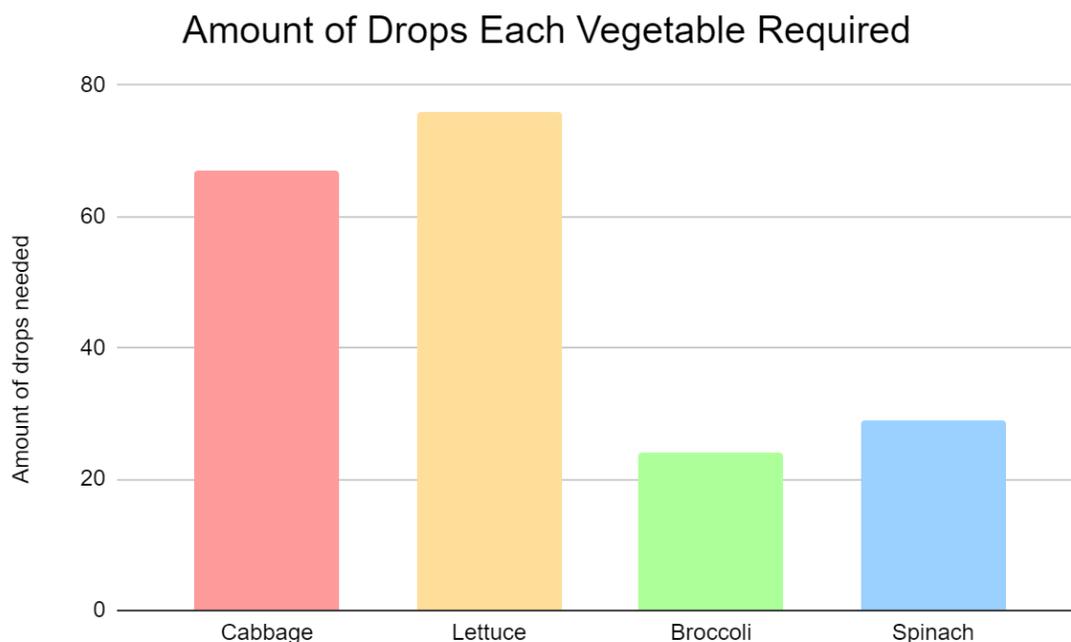
1. Mix together one tablespoon of water and cornstarch
2. Add this to 250 mL of boiling water, and allow it to boil for 1 minute
3. Let it sit for 10 minutes to cool down
4. Add a few drops of iodine tincture, it will turn blue, this will be your indicator solution

Testing the vegetables

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1. With a dropper, add 5 ml of the iodine indicator solution (which you just made) to a standard 15 ml test tube
2. Add 10 drops of juice into the test tube
3. Clean the dropper and repeat the above for each sample
4. Compare which one turns a darker color, the darker color means there is less vitamin C present in that particular sample.

Data & Observations



| Liquid Veggies | Amount of iodine solution (indicator solution) | Number of drops needed to discolor the indicator | Appearance of indicator |
|----------------|--|--|---------------------------|
| Spinach | 10 mL | 29 | Completely discolored |
| Broccoli | 10 mL | 24 | Almost discolored |
| Cabbage | 10 mL | 67 | Color became light purple |
| Lettuce | 10 mL | 76 | Color became light purple |

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- ★ The first time I did the experiment, I did not measure the amount of water and vegetables I was putting in the blender. This would affect the results and they would not be as accurate.
- ★ The second time I did not count the drops accurately for the iodine while making the indicator solution. I needed to keep a record of this, so I had to repeat the experiment again.
- ★ The third and final time I performed the experiment I was careful about how much iodine I added in the indicator solution, how much water I added, and how much of the vegetables I added into the blender.

2021-01-10

Results

- The dark green vegetables were the winner.
- They were more successful in clearing out the iodine indicator solution, while the light green veggies took way more drops.
- In first place we had broccoli, then spinach, then cabbage, and finally, lettuce.
- The results were based off of which one cleared out the indicator solution better in fewer drops.
- I also researched online, and the results matched with the ones we had gotten.
- They also had broccoli as one of the vegetables with the most vitamin C followed with spinach and cabbage.

2021-01-11

Conclusion

- My hypothesis was correct, the dark green veggie samples showed more vitamin C than light green ones.
- Although my experiment was about green vegetables, this does not mean that dark green veggies have the most or are the only sources of vitamin C. Red and orange fruits and vegetables also contain high vitamin C. Since I was comparing between greens, I concluded my results based on the experiment.
- From this experiment we can infer that dark green veggies protect the immune system, reduce the severity of allergic reactions and help to fight off infections

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because they contain vitamins.

→ Plus, why should we take vitamin supplements when we have these fruits and vegetables waiting to be eaten.

2021-01-12

Importance & Applications

- ★ Vitamin C is an essential nutrient involved in the growth and repair of tissues in all parts of our body.
- ★ It is used to form an important protein to make skin, tendons, ligaments, and blood vessels.
- ★ Vitamin C protects the immune system, reduces the severity of allergic reactions and helps to fight off infections.
- ★ Nutrients provide nourishment. Proteins, carbohydrates, fat, vitamins, minerals, fibre, and water are all examples of nutrients.

- ★ If people do not have the right balance in their diet, their risk of developing certain health diseases increases.

- ★ In order to have a balanced diet, we need to know what is in our food and how much our body needs it.

- ★ This is also helpful for those who buy expensive supplements for vitamins.

- ★ Now that we know which veggies have more vitamin C, we can easily select which vegetable to include in our diet based on our needs.

Improvements

If I were to perform this experiment again, the things I would probably change is the type of indicator solution. For example, the iodine indicator solution I prepared isn't the only one, there are more such as Dichlorophenolindophenol also known as DCPIP. This solution also changes color in the presence of vitamin C. Next time, instead of having the vegetables as my manipulated variable, I could have the indicator as my manipulated variable. From this, I could find out which one is more accurate and in labs, which one should be used for testing more.

Another thing I could change is do it with more types of vegetables. This time I did

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it only with green veggies but next time I could do it with red, orange, yellow, green, blue, and purple fruits + vegetables and test which one of them had more. After finding this out I could see the approximate amount of vitamin C in all of them.