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Grade: 11

School: Lester B. Pearson High School

Project Type: Experimental (Bio-chemistry)

Project Title: Effect of Crude Okra-Derived Mucilage Concentration on Microplastic Flocculation and Sedimentation in Freshwater

Task/Activity	Notes/thoughts/observations
Brainstorming, project ideation, and background research	<p>For my project I want to do a project related to tamarinds apparently being able to remove microplastics from the body, which I saw from a video online.</p> <p>After doing a little research I found that fenugreek and okra are shown to be highly effective at removing microplastics from contaminated water. I've also found that tamarind, fenugreek, and okra have been shown to be able to remove microplastics from contaminated water, but not from the body, which the video misinformed. The research study that tested fenugreek, okra tested them on their ability to remove microplastics from environmental water sources. I also came to learn that the polysaccharides in tamarinds that are responsible for removing microplastics are broken down by the enzymes in the digestive system, making them ineffective. This means that tamarinds cannot remove microplastics from the body through ingestion. Instead of framing my experiment around removing microplastics from the body, I'll instead reframe it around removing microplastics from freshwater sources. Instead of Tamarind, I'll look at okra because studies have shown that okra is more effective at removing microplastics from water than tamarind.</p>
Background research, and forming a question and hypothesis	Today I will be creating my testable question, hypothesis, and doing my background research. For my background research I will

	<p>be answering the following questions:</p> <ul style="list-style-type: none"> • What are microplastics? • Why are microplastics a problem? • How do they enter freshwater systems? • The Problem: current methods used to remove microplastics • What are natural flocculants? • Why I am using Okra • Relevance <p>For my experiment I'm going to have to use crude okra-derived mucilage, because I don't have the tools and lab resources to create a pure polymer extract like the researchers did at Tarleton University :(although, if I did have lab access and tools to do it I definitely would!</p>
<p>Finishing Background Research and Variables</p>	<p>Today I'll just be finishing up my background research and start working on my variables.</p>
<p>Creating a procedure and determining my variables.</p>	<p>For my procedure I designed it so that I would only need school-lab access at most to complete my experiment. Most of the preparation like extracting the mucilage from the okra will be done at home. At first, I was going to buy lab-grade microplastic particles, but after seeing the prices and shipping time for them I decided against it. Instead, I will be making my own microplastics at home. For my variables I will make a table for the controlled variable explaining how they will affect the dependent variable and how I will control it in my experiment so when I go back and finish my procedure I can ensure that all of the control variables are being taken into account.</p>
<p>Finishing the procedure</p>	<p>Today I will mainly be focusing on finishing my procedure and getting it approved by Mr. Bianchini. I am just focusing on making sure that my procedure is detailed and that I have all of the tools and resources to make it as successful as possible. I have had to change some steps and materials to make sure it</p>

	<p>aligned with my limited resources, but other than that it's coming along pretty well. With the help of Mr. Bianchini I was able to get it done and now I will just be waiting for lab approval from the school. I'm probably going to prepare my okra extract and microplastics on Sunday and conduct my experiment the following Monday so that my okra extract doesn't experience much degradation.</p>
Collecting Materials and observation prep	<p>Today I went to the store and bought the materials that I needed like the fresh okra, distilled water, digital scale, etc. I will also be preparing the plastic today because I need to freeze it overnight and grind it tomorrow. I'm not sure what plastic I will be using yet because it has to be a single type of plastic and I want to make sure that the plastic is actually relevant to the problem. I'll research which types of plastic usually pass through the sedimentation and filtration phase of wastewater plants and try to find some at home that I could use. I have also set up my observation outline in preparation for my experiment.</p>
Preparing the microplastics and okra mucilage	<p>Today is the day before my experiment (Sunday). I will be preparing the microplastics and okra mucilage for tomorrow. Yesterday night I washed and cut up two pure life water bottles into small pieces and put them in a glass container to sit in the freezer overnight and become more brittle. Today I put the cut up bits of plastic into a new coffee grinder (that is dedicated for this experiment and will not be used again) and grinded them for about an hour. It was a pretty slow and gruelling process because I had to make sure the grinder wouldn't overheat from working for too long. After I had grinded the plastic I passed it through a sieve and onto a piece of paper until no more bits of plastic would come out. I then repeated the process until I</p>

had 0.10g of microplastics. Once I had the right amount I stored the microplastics in a small jar and kept it in a safe place. Next, I prepared the okra mucilage. I cut up an okra pod into 0.5cm pieces and weighed them out until I had 10g. After that I put the okra slices into a beaker with distilled water and heated it on a hot plate. I monitored the extraction closely with a thermometer in order to not exceed 70 degrees celsius. I gently mixed the extraction every 4 minutes and after 30 minutes I took it off the heat and allowed it to cool. Once the extract had cooled I ran it through a coffee filter to remove the larger parts. Once the extraction passed through I re-weighed it to get the final volume. To store it, I placed it in a sealed, air-tight container in the fridge with the thermometer beside it to make sure the temperature remained at 4 degrees celsius.

Experiment Day!

I got to school at around 8:00am to do my lab at school. My coordinator and supervisor, Mr. Bianchini had already set up all of the materials and the lab so I got straight to work. I started by doing a 'pre-trial' so I could do the real ones properly and learn from any mistakes I made in the first one which actually ended up benefitting me a lot. After the pre-trial I felt prepared for the real ones so I began. The trials went pretty smooth though the second trial's results weren't as good which is most likely because of an error I may have made. I recorded all of the results in my notebook and took pictures on my phone to look back on later if I needed to. Analyzing the samples under the microscope probably took the longest but I still had to work quickly so that evaporation wouldn't ruin my samples. Once I got back home I started using the data to do the various calculations and organizing it into tables. For the calculations I used excel

	<p>a lot to help make the process easier and simpler. For the actual fair I think I will add more to my analysis and research section, especially by explaining the mechanism behind the results in depth. Now that I've basically finished I will go back and add more, edit, and get some feedback from my teachers and coordinator so that I can present an even better version at the fair!</p>
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