


**Title:** Dirt to Detox: Unveiling the Effects of Laundry Greywater on Seed Germination - **Logbook**

Name: Ravneek - Grade: 9 - Renert School

<b>DATE</b>	<b>ACTION</b>	<b>RESOURCES USED/ Pictures</b>	<b>OTHER NOTES</b>
September 20, 2024	<ul style="list-style-type: none"><li>- Chose Topic: Which type of greywater is better for plant growth?</li><li>- Started Background Research</li></ul>	<ul style="list-style-type: none"><li>-<a href="https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/provincial-composting-toilet-manual.pdf">https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/provincial-composting-toilet-manual.pdf</a></li><li>-<a href="https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvSci_p040/environmental-science/recycling-greywater-can-plants-tolerate-it">https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvSci_p040/environmental-science/recycling-greywater-can-plants-tolerate-it</a></li></ul>	
October 3, 2024	<ul style="list-style-type: none"><li>- See more information on topic</li></ul>	<ul style="list-style-type: none"><li>-<a href="https://partner.projectboard.world/ysc/project/reviving-resources-harnessing-soap-nut-greywater-for-sustainable-plant-growth">https://partner.projectboard.world/ysc/project/reviving-resources-harnessing-soap-nut-greywater-for-sustainable-plant-growth</a></li></ul>	
October 4, 2024	<ul style="list-style-type: none"><li>- Background research</li><li>- Mentor chosen</li></ul>		<ul style="list-style-type: none"><li>- Three soaps (dish soaps). If so, out of sink or made separately since out of sink water contains food particles from pervious</li></ul>

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October 9, 2024	Finished half of the background research. Mostly found information on the topic and pasted resources on the doc. Added resources		Still have to turn resources into apa format  Written on google docs. Need to finish up any other details
October 10, 2024	Finished all of the background research. Added resources		Submitted the information. Apa format resources still need to be fixes
October 14, 2024	Turned all references into APA format		
October 15, 2024	Started to create a rough draft for proposal		

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October 16, 2024	Finished the rough draft of the proposal	Google slides	
October 20, 2024	Started to edit and create a final draft for proposal Created a better title name	Google slides	
October 21, 2024	Continued to make minor changes to the proposal	Google slides	
October 22, 2024	Added final touches to the proposal and edited over last time. Updated references	Walle, A. V. d., Kim, M., Alam, M. K., Wang, X., Wu, D., Dash, S. R., Rabaey, K., & Kim, J. (2023, October 16). <i>Greywater reuse as a key enabler for improving urban wastewater management</i> . Science Direct. Retrieved October 22, 2024, from <a href="https://www.sciencedirect.com/science/article/pii/S266649842300042X">https://www.sciencedirect.com/science/article/pii/S266649842300042X</a>	
October 25, 2024	Present the proposal		

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<b>DATE</b>	<b>ACTION</b>	<b>RESOURCES USED/ Pictures</b>	<b>OTHER NOTES</b>
October 30, 2024	Obtained results for the proposal		
November 1, 2024	Register for CYSF and filled out basic information		
November 22, 2024	Received CYSF Contract to get signed by parents		To bring back (signed) on November 29, 2024
November 27, 2024	Created a timeline of how project should go according to dates set out	Google sheets	Remember to edit and add in case any changes come up
November 28, 2024	Obtained the growing light needed to grow seeds/plants in winter		Have to return light to school by March (date exactly unknown)

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<b>DATE</b>	<b>ACTION</b>	<b>RESOURCES USED/ Pictures</b>	<b>OTHER NOTES</b>
December 1, 2024	Wrote down variables and hypothesis in my document	Google docs	Can edit later on if needed
December 6, 2024	Started to work on the materials and procedure	Google Docs	Finish according to schedule in possible
December 10, 2024	Wrote down material and procedure on a piece of paper	Piece of paper and a pen	Only reason I used paper was because the battery on laptop had dies and sister was using the charger
December 11, 2024	Started experiment on December 11, 2024 at 8:00 am. The temperature on the house is 18 degree celsius. Wrote in hard copy logbook.	All materials listed in presentation.	Time is 8:00 am since I did not go to school on time that day.
December 13, 2024	Dr. Shahin overviewed my schedule . Wrote the procedure and materials on the docs	Google Docs	Make sure to re-edit the things in case more detail is wanted




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December 15, 2024	As I was observing the plants and watering them, I noticed that pot 4 (tap water) had germinated a little sprout. This was the first of the 4 to grow.		The white slightly showing is the seed. The most visible white is part of the soil for nutrients.
December 18, 2024	It has been a week since the seeds had been potted. The plant in pot 4 had grown larger than before. No other seed has germinated currently.		
December 20, 2024	No other seed has still germinated. Pot 4 seed's sprout is growing more and more every day.		The lights above make the plant seem shiny. It is actually slightly dull.






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December 22, 2024	I had started to water the plants and had noticed that the seed in the pot 1 (gain greywater) has started to grow slightly		The slight hint of green in the seed sprouting
December 24, 2024	The sprout for pot 4 seems to bend more, as if the stem is trying to exit the dirt		No other seed has germinated
December 25, 2024	Today marks the 2nd complete week of the trial. Overnight, the sprout in pot 4 has grown out of the soil. The original bending was because the seed was still getting rid of its shell to grow out the leaves.		The leaves are in the shape of the seed.

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December 28, 2024	I noticed that the seed in pot 1 had not germinated. It confused me, since the sprout did not grow any more.		The seed is not visible at all. I wonder what happened.
January 1, 2025	Today was the last day for Trial 1. No other seed has germinated. When I dug under the soil, the seeds from pot 2 and 3 (tide and ecomax) had rotted. The seed that had grown from pot 1 had gotten fungi. After researching, I learned that the bigger the seed, the more likely it will rot in a small pot as moisture tends to stay. I am not sure if to continue with lima beans.	The Gain Seed  The Ecomax Seed 	The Water Seed  The Tide Seed 






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January 2, 2025	Another trial was started. This time, it was decided to use pea seeds in order to stop the seeds from rotting. The temperatures of the house was 18.5 degree celsius.		This may the start of the new experiment as pea seeds are more likely to germinate in these pot.
January 6, 2025	As I was observing the plants, I noticed that a green stalk was growing out of each of the pots (tide, gain, ecomax, and water). This was shocking to me as I did not expect all of them to grow at once.		
January 8, 2025	This morning I noticed that many sprouts had germinated overnight. Now, there are 3 sprouts in water, 1 in ecomax, 3 in tide, and 2 in gain.		Some seeds may not seem as clear in the photo. They are visible in person.



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January 9, 2025	Today marks the start of the second week of this trial. I noticed that another seed had grown out of ecomax, now making that every pot has at least 2 seeds germinated.		
January 12, 2025	As I was watering the seeds, I noticed yet another sprout coming out of the ecomax pot. It is small, but growing.		
January 16, 2025	Today is the end of the second week for the trial. The plants in gain pot seem shriveled. The tide plants seem affected as well, the leaves a grey green. The ecomax plants seem not as affected, and the water plants are fine.		

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January 20, 2025	The end of this trial is near. Currently, 3 plants have germinated in the ecomax pot, water pot, and tide pot. There are 2 plants in the gain pot. The plants in tide are tall, but the leaves are shriveled and close to the stem. 1 plant in gain seems healthy, while the other is small and a grey-green colour. The plants in water and ecomax are healthy.		The other plant in the background in the lima bean water seed that had germinated. I water it constantly as well.
January 23, 2025	This was the end of this trial (3 weeks). The shortest plants were the tide pot plants. The healthiest plant (out of the three detergents) was in ecomax. One of the plants in the gain pot were shrivelled. This trial results were that ecomax greywater is best for plant growth. Data on the next slide.		

### Trial 1 Data Results

Tide Greywater	Plant #1	Length: 2.5 cm	Width: 1.5 cm
	Plant #2	Length: 3 cm	Width: 1.5 cm
	Plant #3	Length: 2.5 cm	Width: 1 cm
Gain Greywater	Plant #1	Length: 5 cm	Width: 2.5 cm
	Plant #2	Length: 6 cm	Width: 3 cm
	Plant #3 (did not grow)	Length: N/A	Width: N/A
Ecomax	Plant #1	Length: 6 cm	Width: 3.5 cm
	Plant #2	Length: 6.5 cm	Width: 4 cm
	Plant #3	Length: 5 cm	Width: 3 cm
Water (control group)	Plant #1	Length: 6 cm	Width: 4 cm
	Plant #2	Length: 7 cm	Width: 4.5 cm
	Plant #3	Length: 5.5 cm	Width: 4 cm





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January 27, 2025	Today, the second trial was started. The seeds were planted at 2:00 pm and watered after planting.		The first trial with the lima beans did not work, and since the pea trial did work, 2 more pea trials will be conducted.
February 2, 2025	Today, I noticed that there was a sprout in the water and gain pot.		
February 3, 2025	Today concludes the first week of trial 2. Another seed sprouted in gain, and a new sprout grew in the ecomax and tide pots.		




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February 4, 2025	All the pots now have three sprouts. They have grown over night. Also, I have started the 3rd trial today at 4:30pm.		
February 7, 2025	So far, the water seeds are sprouting the healthiest. The ecomax sprout is quite tall but has few leaves on it(the one with the blue sticky)		
February 10, 2025	The second week of the second trial has ended. Water is still the healthiest. The tide plants are shriveled, and the ecomax plants have gained height. Gain is in between tide and ecomax. Also, in trial three, there are 2 sprouts in gain and tide, and 1 in water and ecomax.		Trial 3. (Bottom to top) Ecomax, gain, and tide. Water is on the side. 



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February 11, 2025	This is the end of the first week of the third trial. Currently, a second sprout has germinated in the water pot. Other than that, no new seeds have sprouted.		
February 14, 2025	Today, I noticed (in the third) that two new sprouts had germinated in ecomax and a third one in gain. Currently, in the second trial, the results are still the same.	Trial 3 	Trial 2 

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February 17, 2025	<p>Today was the end of trial 2. There were three sprouts in every pot. The tide sprouts were a dark grey green, and one of the ecomax sprouts grew very tall it height, but had very few leaves. The healthiest was still ecomax in comparison to the other grey waters. (Data on next slide)</p>	 A photograph showing four small orange pots in a white tray. From left to right, the pots are labeled 'WATER' (yellow), 'ECOMAX' (blue), 'TIDE' (green), and another label (green). Each pot contains a small green sprout with leaves. The sprouts in the 'WATER' and 'ECOMAX' pots appear larger and more developed than those in the 'TIDE' and the unlabeled pot.	
February 18, 2025	<p>Today is the end of the second week of trail 3. There are three sprouts in all but the tide pot, which has two. One of the ecomax sprouts is under the leaves of the other one, so it has not grew much. The tide sprout leaves are crowded together (last on at the top id tide, the in middle is gain, and end is ecomax. On the side is water)</p>	 A photograph showing four small orange pots in a white tray. From left to right, the pots are labeled 'WATER' (yellow), 'ECOMAX' (blue), 'TIDE' (green), and another label (green). Each pot contains a small green sprout with leaves. The sprouts in the 'WATER' and 'ECOMAX' pots appear larger and more developed than those in the 'TIDE' and the unlabeled pot.	





## Trial 2 Data Results

Tide Greywater	Plant #1	Length: 3.5	Width: 2 cm
	Plant #2	Length: 4 cm	Width: 2.5 cm
	Plant #3	Length: 3 cm	Width: 2 cm
Gain Greywater	Plant #1	Length: 5 cm	Width: 2.5 cm
	Plant #2	Length: 5.5 cm	Width: 3 cm
	Plant #3	Length: 4.5 cm	Width: 2.5 cm
Ecomax	Plant #1	Length: 4.5 cm	Width: 3 cm
	Plant #2	Length: 9 cm	Width: 2.5 cm
	Plant #3	Length: 5 cm	Width: 3.5 cm
Water (control group)	Plant #1	Length: 6 cm	Width: 4 cm
	Plant #2	Length: 7 cm	Width: 4.5 cm
	Plant #3	Length: 6 cm	Width: 4 cm

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February 21, 2025	One of ecomax sprouts and one of the water sprout has seemed to not make a difference (they are hidden under the leaves under the bigger plants). I wonder if they will grow more.	 A photograph showing four orange pots containing small green sprouts, arranged on a white plastic tray. The plants are at various stages of growth, with some having more developed leaves than others.	
February 25, 2025	This is the end of the third trial. The healthiest of all three detergents is, once again, ecomax sprouts. The tide pot only had 2 sprouts, where all the other pots have three plants. Tide plants did have a different shade of green in comparison to the other plants. The two sprouts I was not sure of if they would grow morer did end of growing on the last few days.	 A photograph showing four orange pots containing plants, arranged on a black tray. The tray has three yellow labels: 'ECOMAX', 'GAIN GAIN', and 'TIDE TIDE'. The plants are at different stages of growth, with some having more developed leaves than others.	

### Trial 3 Data Results

Tide Greywater	Plant #1	Length: 4.5 cm	Width: 2.5 cm
	Plant #2	Length: 4 cm	Width: 2.5 cm
	Plant #3 (did not grow)	Length: N/A	Width: N/A
Gain Greywater	Plant #1	Length: 3 cm	Width: 2 cm
	Plant #2	Length: 3.5 cm	Width: 2 cm
	Plant #3	Length: 2 cm	Width: 1.5 cm
Ecomax	Plant #1	Length: 6 cm	Width: 4 cm
	Plant #2	Length: 5.5 cm	Width: 3 cm
	Plant #3	Length: 5 cm	Width: 3 cm
Water (control group)	Plant #1	Length: 6.5 cm	Width: 4.5 cm
	Plant #2	Length: 7 cm	Width: 4.5 cm
	Plant #3	Length: 5.5 cm	Width: 3.5 cm

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February 28, 2025	I started to add my background research, variable, hypothesis, and procedure onto my research paper.	Google Docs	
March 1 - March 6	I worked on my research paper, adding my graphs, charts, analysis, conclusion and more. I refined it on March 6 for last edits for first draft.	Google Docs & Google Sheets	
March 10, 2025	I sent my paper to Ms. Haney, my mentor, to have a look over and to give me back feedback.		
March 12, 2025	I received my feedback from Ms. Haney, and started to work on the edits.		
March 14, 2025	I worked on the feedback and comments given to me. I also asked my English teacher, Ms. Adrienne, to look over my paper for grammatical errors.		

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February 15, 2025	I had arranged all of my information into a presentation format on powerpoint for my video.	Powerpoint	Information may be too much, so video might go over limits. In that case, either speak fast of cut information.
February 16, 2025	I created my video presentation and uploaded it onto youtube. I also finished transferring all of my information onto the CYSF platform.	CYSF platform, Research Paper	