

The Effect of Greywater on Radish Plant Germination.

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Abstract

We use 10 billion tons of water everyday. Conserving water is something that our planet as a whole needs to get better at. If we start watering more of our plants with greywater then we can help conserve water in our area. The water we use to wash our clothes or dishes creates something called greywater. Greywater is any lightly used water, greywater is a very useful resource we don't use as much as we should. You can use greywater for a number of things but for my experiment I will be using it to water radish seeds and record their germination progress. If I am successful with my experiment then this can be one step closer to conserving more water. I started with using no greywater on my first group of seeds and used that as my control. Then I used 50% greywater and 50% of greywater to see what impact that would have on the plants and for my final group I used 100% greywater. I recorded the height of the plants every day for 14 days. My results show that the plants receiving no greywater were the healthiest, they consistently grew and they did not die at any point in the experiment. 50% greywater did okay, the plants didn't grow as well and as fast as the plants that received no greywater but none of the plants died. 100% greywater struggled to keep each plant healthy and growing, some plants did end up dying and others didn't seem to grow as fast and healthy.

Introduction

We use water every day. The human body needs water to survive. But we are not the only living thing that needs water to survive. Plants need water just like us. Water is needed for photosynthesis, plants use sunlight to make energy that the plants need to survive. (West Virginia University 2021). Water is responsible for the structure of the cell in many plants. Without water plants will start to brown, the leaves will curl and the plant will eventually die. We need plants to survive as well. Plants provide oxygen that we need to survive. When watering gardens or plants, you should water them everyday thoroughly. That's when greywater is brought up. Greywater is any lightly used water. It can also be leftover or untreated water. It is water from basins,baths,showers, sinks, washing machines and more, and greywater is pumped into a surge tank. It can be used in plants/gardens. Greywater can contain dirt,hair,grease,and cleaning products, these factors are what makes greywater, greywater.

Plants react very well to gray water according to gwig.org. There are microorganisms and bacteria that feed off carbon and pathogens in the ground and soil. In result they leave water and non polluting insolubles that are very good for plant growth. Greywater helps whole fields grow to be healthy. Using grey water saves a ton of water, reusing water is better for our environment, by reusing this water it's less likely to end up in sewers or septic systems that will eventually end up polluting our rivers and lakes. (Elemental.green 2022). Something to be careful of is storing greywater for over 24 hours. After 24 hours of being stored the nutrients will start to break down.

Greywater systems are actually quite simple and inexpensive. For example you can use the laundry to landscape the system. Without any plumbing this gravity based irrigation system

takes the greywater from your washing machine into your backyard. The greywater then helps your garden and backyard grow to be lively and healthy. A greywater system like that would cost around \$150 - \$300 not including labor costs (elemental green). You can also make a simple at home Greywater system. According to Valleywater.org greywater systems can be as simple as a bucket catching rain or shower water. Then the Greywater collected in these buckets can be used to water gardens or any plant that you have. Greywater is not limited to a certain kind of plant. You can use greywater to water any household plant that you have.

Greywater is great for growing beautiful flowers and bushes but it should not be used for root vegetables or fruits. This is because some greywater can contain bleach, or other toxic household chemicals that then would be transferred to the plant. (Pacific Horticulture 2022). When using a greywater system be sure to use safe dish and laundry soaps so no harmful chemicals or bacteria can get into your greywater. Or you could simply just turn the system off when using chemicals like bleach, chlorine, or other harmful chemicals. That is not the only answer though, other resources say you can grow vegetables and fruits with greywater. GreywaterAction.org says that fruit trees thrive on greywater. All kinds of fruit trees can tolerate frequent watering with greywater. For other plants like flowers, bushes or anything commonly found in gardens greywater is a great choice. So you can use greywater for any type of plant, you just have to be careful about what greywater you use to plant the foods you are planning on eating.

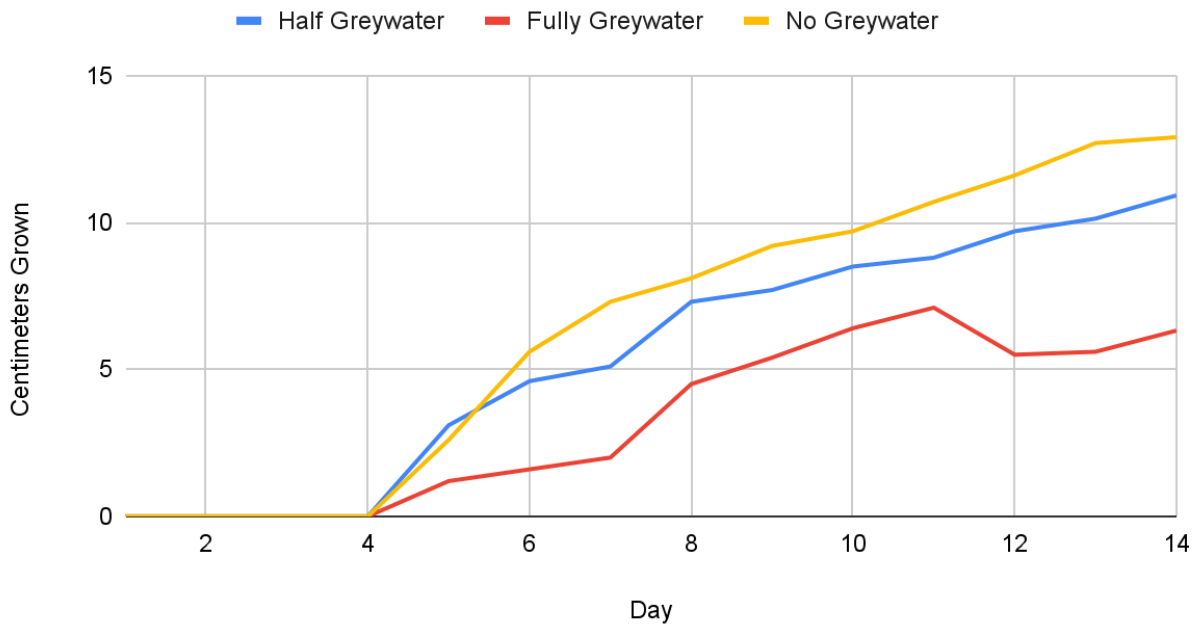
Hypothesis

My hypothesis is that when Radish Plants are grown with and without greywater (lightly used water), then the plants with just greywater will germinate faster and continue to grow more than the plants without greywater because of all the natural benefits that greywater has, like all of the added nutrients it adds to your soil to encourage growth.

Methods

Day 5	3.5 cm	2.03cm	2.5cm	3.5cm	3.3cm	2.5cm	1.9cm	0cm	1.5cm
Day 6	6.8cm	5cm	5cm	3.8cm	5cm	5cm	2.5cm	0cm	2.5cm
Day 7	8.4cm	6.7cm	6.8cm	4.4cm	5.6cm	5.3cm	3cm	0cm	3cm
Day 8	9.3cm	7.6cm	7.6cm	6.6cm	6.8cm	8.6cm	5cm	3.5cm	5cm
Day 9	10.1cm	9.4cm	8.1cm	6.8cm	7.7cm	8.6cm	6.5cm	4.8cm	5cm
Day 10	10.16cm	10.16cm	8.89cm	7.62cm	8.89cm	8.89cm	7.62cm	6.35	5.3 cm
Day 11	11.43cm	11.17cm	9.6 cm	7.62cm	9.3cm	9.5cm	8.6cm	6.35cm	6.35cm
Day 12	12.7cm	12.19cm	10.16cm	8.8cm	10.16cm	10.16cm	8.8cm	n/a	7.6cm
Day 13	13.97cm	13.97	10.16cm	9.3cm	10.16cm	10.92cm	8.9cm	n/a	7.9cm
Day 14	14.22cm	14.5cm	10.16cm	9.9cm	11.43cm	11.43cm	10.16cm	n/a	8.8cm

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Discussion:

Based on the evidence in my table my hypothesis was incorrect. The plants that did not receive any sort of greywater had the best growth rate and stayed healthy the longest. 100% greywater actually did the worst out of the 3 groups. 50% greywater did pretty average and was somewhat in the middle. This is because the greywater had things like soap and cleaning supplies in them and when watering your entire plant those chemicals can be absorbed by the plant and harm it causing it to wilt and die. This explains why the plants with no greywater thrived and did the best of all the groups, they did have any greywater to absorb. This also explains why the 50% greywater group did pretty average because it did have some greywater but it also had some regular tap water so it wasn't absorbing as many harmful chemicals. So if you are planning on using greywater to water your house plants then I would recommend to be very careful with what goes into your greywater before watering your plants with it or to use half greywater half tap water or alternate so you don't damage your

plants. Greywater is still a useful and eco-friendly tool to use when watering plants, you just need to be more careful about what kinds of greywater you are watering your plants with.

Limitations

The biggest limitation I had was that I couldn't use the same greywater each time I watered my radishes. Each time I watered my plants I had to use different greywater that could possibly have different amounts of nutrients and have more or less soap, food, grease etc. Another limitation I had is that I was not able to have as many groups of plants. If I had more variations in greywater I could have more accurate results. I also could not water my plants everyday because they were starting to become over watered so I couldn't water them as often as I wanted to. Towards the end of my experiment the group that received 100% greywater started to droop and die so it was harder to measure the plants to get accurate results. Overall there weren't a lot of limitations because I was able to have two full weeks and plenty of resources.

Future studies

For my future studies I can study the effects of different types of greywater on radish seed germination. I only used greywater from my sink but you can collect greywater from various other places like dishwashers, washing machines and showers. Another possible experiment I could conduct is the effect of greywater on edible plants and if they contain diseases or are toxic due to the greywater. I could also do the effect of greywater nutrient deficiencies and deformed plants. The effect of greywater on large crop growth could be a possible future experiment, this could really help farms around the world conserve water. Another experiment I could do that doesn't use plants is to make my own greywater system to try and preserve water. One very important aspect of growing plants is the soil. What effect does greywater have on soil? Those are just a few of the many future studies that I could conduct on greywater.

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