

PlantingScience Journal

Research Question - 2/22/24

How much salt can plants tolerate before they can no longer tolerate it? We wanted a way to save freshwater for other necessary things like drinking. If the plants can grow with salt water then we don't need to use fresh water to water the plants.

Predictions - 2/22/24

We think that the plants will be able to tolerate small amounts of salt in the water for a certain amount of time before they are not able to survive and grow. The salt may affect the plants but they will continue to grow. It may immediately mess with the growth and the survival of the plant. This will happen because plants don't typically grow with salt water. If the plants can survive any salt while they're sprouts, then we will increase the salt even more drastically to find the level of salt they cannot tolerate. We think this will happen because plants are not designed to use salts in their life functions.

Experimental Design - 2/22/24

Materials -Eight containers of buckwheat - about ten seeds per pot -Eight containers of radish - about ten seeds per pot -Salt -Water -Soil -Teaspoon -Pots -Liter bottle
How It Will Work -Buckwheat will be spaced a few inches apart with a thin layer of dirt on top.
-Radishes will be spaced a few inches apart with an extremely thin layer of dirt on top. -Peas, buckwheat, and radishes will get about seven to eight hours of sunlight per day. We will dilute salt in a lot of water, then we will increase the amount of salt after a few days.
-We will be measuring the salt in teaspoons. -We will be measuring the water in liters. -The control will have 0 teaspoons of salt per 1 liter of water. -The low amount of salt water will have 1 teaspoon of salt per 1 liter of water. -The medium amount of salt water will have 3 teaspoons of salt per 1 liter of water. -The high amount of salt water will have 6 teaspoons of salt per 1 liter of water. -The soil will be soaked in water completely before we put the seeds in the pots

Entries

3/4/24

We planted buckwheat and radishes in the 16 pots. We planted five seeds per pot in all of them. Each pot was given one cup of soil which was soaked and drained. The seeds were placed with a small layer of dirt on top of them and left alone. There were

eight pots for buckwheat and eight pots for radishes. Two for high salt, two for medium salt, two for low salt, and two controls with no salt. We did this for both buckwheat and radishes.

3/7/24

All the plants were left alone for four days before they were checked. All of the plants were moist enough not to be watered but they weren't sitting in water. Radish pots all had seedlings in them. (All radishes) All of them are curling around themselves like they're unfurling but their stems are too weak to support the weight. They have small green leaves that look like lighter, crunchier lettuce. Their stems are a faded greenish white. You can see the seed with the stem coming out of it like a flower on top. There was mold where the stem had been against soil because it was wet.

| Dates | Radish Control - 0 tsp salt/liter water (cm averaged) | Radish Low - 1 tsp salt/liter water (cm averaged) | Radish Medium - 3 tsp salt/liter water (cm averaged) | Radish High - 6 tsp salt/liter water (cm averaged) | Buckwheat Control - 0 tsp salt/liter water (cm averaged) | Buckwheat Low - 1 tsp salt/ liter water (cm averaged) | Buckwheat Medium - 3 tsp salt/ liter water (cm averaged) | Buckwheat High - 6 tsp salt/ liter water (cm averaged) |
|---------|---|---|--|--|--|---|--|--|
| 3/8/24 | 1.3 | 1.1 | 1.4 | 1.2 | No growth | No growth | No growth | No growth |
| 3/11/24 | 4.9 | 5.4 | 5.4 | 6.9 | 3 | 2 | 4 | 3.3 |
| 3/13/24 | 9.6 | 9.8 | 8.4 | 5.8 | 8.7 | 7.5 | 7 | 4.5 |
| 3/15/24 | 9.5 | 11.2 | 10.5 | 6.6 | 12.4 | 9.8 | 9 | 8.5 |
| 3/18/24 | 10.6 | 11.6 | 5.8 | 6.3 (dead) | 14.4 | 12.1 | 5.5 | 6.5 |
| 3/19/24 | 12.5 | 13 | 8.8 | dead | 13 | 9.5 | 6 | 3.5 |
| 3/22/24 | 12.6 | 14.5 | ½ dead | dead | 14.3 | 11 | 6.5 | dead |

3/11/24

The radishes are definitely starting to thrive and grow. In only a few days they grew a considerable amount of leaves and centimeters taller. They have green leaves but a few only have a black top, not green. The lighter colors of green are near the middle of the stem. The brown seeds that they grew out of are visible on the bottom of their leaves. They're very weak and floppy, and they can't stand on their own so they lean against the side of the pot. The end of the leaves on some plants are darker than the other parts of the plant. There's veins on the bottom of the leaves, but they're pretty small. The buckwheats are growing but there's one pot in the buckwheat highs that might have been getting the only sun, so it's much taller than the rest. Every pot in both categories was given $\frac{1}{4}$ a cup of water. Most of them had been rated at a 1 or a 2 for moisture though a few buckwheats were a 4 or 5. After watering them they were 8s, 9s, and 10s.

3/13/24

Some of the plants are visibly struggling with the salt and when the plants were given the salt water, they were taken out of the window and didn't have any sunlight. So along with having tainted water, they weren't being what they needed. Most of the plants are still taller than they were on Monday but their stems are still very weak and some have kinks in them. The soil doesn't need to be watered because they all had a moisture rating of over 6. The leaves are much larger so the plants should be doing better but the leaves are curling in on themselves. Some of the pots are dying out and are not catching up with the others. All the highs and mediums aren't doing as well as the controls as the controls and lows. Salt is definitely making the plants sickly, and they aren't doing as well as they were without the salt.

3/15/24

For a few days all of the plants have been out of the sun and in a dark corner. They were watered 3/11/24, so from now, that was 4 days ago. They were watered today with the correct salt amount and were given $\frac{1}{4}$ cup water each. All the plants are visibly worse than the last time they were in the sun. They are super droopy, a more unhealthy color, a more gloomy, darker, green. The stems are becoming a translucent shiny, and the way they look overall is showing us they're dying. The stems are leaning against the side of the pots and some of them are kinked. They're pretty long, but because they haven't gotten what they needed, they can't support their own weight.

3/18/24

Our plants are getting progressively worse. They were water Friday and were in the sun all weekend but they're dying from the salt. The highs in both types are pretty much gone. The stems are so thin they look like string and the color is so unhealthy looking. The controls and lows are doing pretty well but they lean against the side of the pot a lot. There are some freestanding plants but they tangle together for support. The stems are pretty good but the leaves are much bigger and are doing their jobs. All the plants are doing worse than they were doing in the beginning but there are definitely not all completely dying.

3/19/24

I haven't noticed any significant changes in any of the plants beside the high radishes which are completely shriveled and dead. All of the living plants are very floppy and have kinks. They've been in the sun and are doing better than they have been. We didn't water them because they were still wet and wouldn't have benefited from being drowned. Their color has improved to a more dark, healthy green. The leaves are doing their jobs and have fanned out more.

3/22/24

A lot of the plants are dead including some mediums and highs. A few are still holding on. Their color isn't the worst and the stems aren't as weak as they used to be. Their color is between healthy and getting sick but the radishes have a new shiny red and pink near the bottom to medium of the stems. The mediums and high that died have crystalized salt covering the top of the soil and crusting at the edges. The leaves are well fanned out and they were all watered except the highs of both types which were both considered to be dead. All the plants were watered with $\frac{1}{4}$ cup of water besides the highs which confirmed all dead. The controls, lows, and mediums were watered because the first two were very much alive and some of the mediums were holding on.

3/25/24

The plants were all still at nines and tens for moisture so we decided not to water them. Most of the plants have taken on a much lighter color. The buckwheat controls are getting super long and they have a pinkish red color. The radish lows are tall but not as healthy as the controls. The buckwheat lows and controls are not doing as well as they have been. There are a few more leaves on them and they have a fringe at the edge. The stems aren't flopping, they're kinking, which might be making them worse. There's one remaining plant in the buckwheat medium and then all the controls and lows in both categories. They have not been in the

sunlight and have been sitting on the counter. The power went out over the weekend so the plants have been in a much cooler temperature.

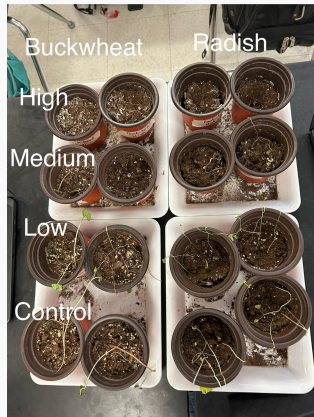
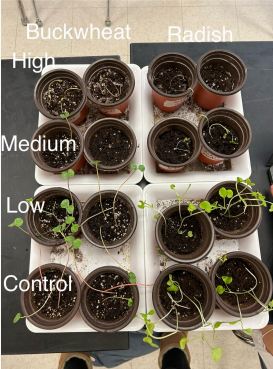
4/1/24

All our plants have been out of the sun for a week as well as having no water. All of them are confirmed dead. The ones that were still alive last week did not die due to the salt, they were not given the resources they needed and the experiment sadly did not get to finish out. The controls did survive for a few weeks and the highs and mediums did not. The controls might have survived the next few weeks but they weren't doing very well anyway. They shriveled significantly

Conclusion

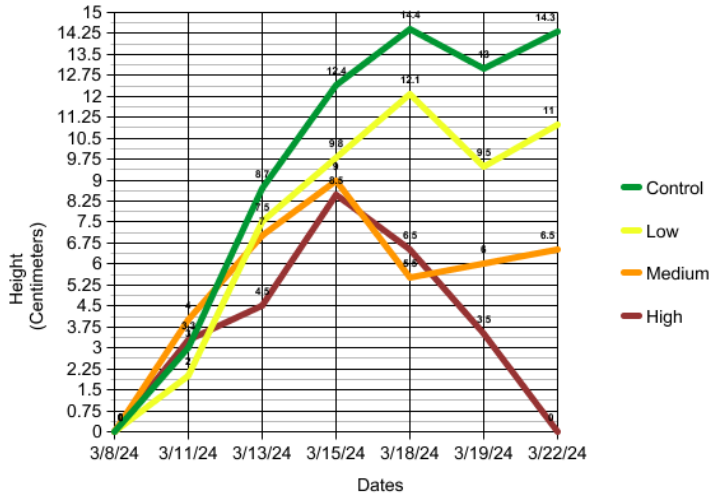
In conclusion, by conducting our experiments we now know that plants cannot tolerate much salt. Plants like buckwheat and radishes do not respond well to high amounts of salt. Plants do not use many salts in their life processes, and instead of helping, it can be harmful to them. We have collected heights that tell us that with certain amounts of salt, how much buckwheat and radish will be able to grow. We discovered that with extremely low amounts of salt, a buckwheat or radish plant can grow normally. If they are given too much salt, they will not grow, they will sicken, and they will shrivel. Testing more types of plants with a completely stable environment, and more levels of salt. Going back to our predictions, we originally thought that the plants would do better with less and worse with more. We were correct because the highs and lows of our plants were damaged much faster and had significantly more damage than the lows and controls. The only thing slightly off was that the lows would have survived much longer with the small concentrations of salt, which we first thought they would not.

Pictures



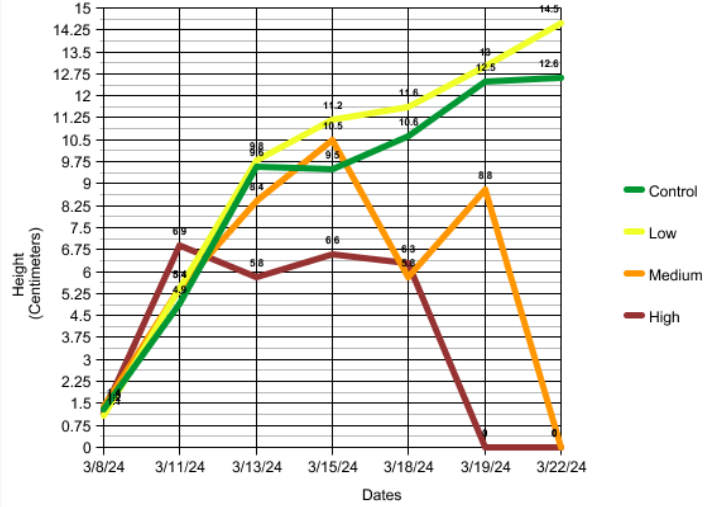
Graphs

Buckwheat Salt Tolerance Graph



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Radish Salt Tolerance Graph



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