February 22, 2024,

RESEARCH QUESTION:
In the group we would like to study about how different amounts of water could affect plants. We will be creating an artificial drought by giving the plant less than average water so the plants, which are radishes and onions will be dealing with limited water, then giving them a normal amount, and then an extreme amount of water that is over what they need, this will represent a flood. We are experimenting on how different amounts of water affect plants.

EXPERIMENTAL DESIGN:
In our experiment there will be two types of plants that we will be working with to get the best possible results. We will be working with radishes and onions. Each of them needs to have their own specific requirements that will be needed to grow, even though we will be putting them through several conditions to see how they react. Radishes are very important for this project because they are how we are getting the information we need in order to see if our research question is correct. So we need to be able to know how to care for them. First, you need to plant your seeds. They should be around a half to one inch deep into the soil and there should be around 4-6 of them in there for one pot. They need to be watered around 25 milliliters every four days for the normal, 40 milliliters for the floods, and then 15 milliliters of water a week for the drought plants. Then, after you have watered them to their regular amounts you need to make sure their soil is good for them, they enjoy sandy soil the best. Next, you need to find them a good area to grow, radishes need around 6 hours of sunlight a day. Then, you wait for them to grow and continue following the steps above throughout their lives. This is the steps for our onion seed experiment. First, the onion seeds need to be soaked for up to 24 hours. Next, we will put it in silt-loam soil. After that, we will sprinkle a little soil over the seeds. For the average amount of water, we will put in .8 cups of water per 9 days. For the moderate drought, we will put in .5 cups every 9 days. For the flood, we will put in 2.4 cups every 5 days. This is the steps for our onion seed experiment. In this experiment we will be using this information so that we can have a successful experiment and we can answer our questions.

PREDICTIONS:
We have some predictions of what will happen when we “flood” a plant, put a plant into a “drought” and then put a plant through its normal plant experience where it gets what it needs. If we give a plant a normal amount of water it will grow how a normal plant does and it will be healthy and will survive. If we give a plant a small amount of water, like in a drought, it will probably die and wilt. When it is overwatered in a flood, we think the plant will drown and die. A plant will grow a normal amount and be an average plant when it gets a normal amount of water. A plant will grow, probably slightly smaller, and

die with a small amount of water if it continues to get a small amount of water for a long period of time such as if a plant would be going through an extreme drought. If a flood happens, we predict it will kill the plants or hurt them. The plants will be growing at different speeds and in different sizes because of the amount of water we will give them. The ones that are in a “drought” will probably grow slower and not be as big because they are getting a limited amount of water, they could easily die as well but hopefully not. When you get a limited amount of water the plant will become very dry and it does not get enough nutrients that they need so they will start to dry out and die. The ones that are getting a normal amount of water for them will probably grow to the size that most of them are and be very healthy. They will grow to the size they are supposed to be because they are getting a normal amount of water so their systems will be happy and functioning because they will have everything that they should need. The ones that are getting too much water and are in a “flood” we think the plant will drown and die. We think they are going to drown because we will be giving them a lot over what they are supposed to, it will overpower the plant and as that absorbs into the soil then the roots get drowned and suffocate because they can’t absorb the water fast enough until they drown.

MATERIALS RADISHES:

- Sandy soil
- .8 cups of water per 9 days for the normal,
- A 2.4 cups per 5 days is overflowing
- .5 cups per every 9 days is a moderate drought
- A 3 planting pots
- Radish seeds need to be planted straight into 1/2-inch-deep soil, spaced about 1/2 inches apart as well. Add 1/2 inches of soil to the pot to cover the seeds and fill in.
- Radishes need cups of water to dry out
- There should be 5 radish seeds per hole

MATERIALS ONIONS:

- Onions need to have 0.8 cups of water per 9 days
- light sandy loam soil
- An onion needs 3 seeds per hole
- Onions are cool weather crops
- Three inches per set
- Onions are planted 1 to 2 inches deep, and 2 to 3 inches deep
- Onions need the same amount of water as the radishes to flood and be in a drought.

CONCLUSION:
In our experiment things did not turn out the way that we had expected. When we had originally thought that the droughts were going to do the worst, then the floods, and then the controls. Instead though the droughts were the worst but then the controls did not do the best, so overall the floods did the best out of all of them. We think that this happened because the school had a problem with the facilities and we could not water them for over a week. This caused the droughts to dry out even more and the controls to start to dry out, the floods which had been almost constantly wet had now reached a good amount of water for them and started to recover from their previous almost dying state. The data supports our claim because in our graph it shows that droughts went down the whole time, the control went up and down, and the floods did very well overall. This does not support our old claim, where the controls did the best, then the floods, and lastly the droughts, but it does support our new one where we said that the floods did the best, then the controls, and lastly the droughts. Future experiments that could include redoing this without the interruption of the school problems, another one would be doing this on a larger scale with more data, and doing the project for a longer amount of time until we got lots of data. In conclusion, through things such as the school having problems, having the wrong idea to begin with, and learning new things about plants we have gained knowledge and experience that will be useful later in life.

MARCH 4:
Today my group and I started planting. We used 6 pots and 3 were for radishes and the other three were for the onions. In the 3 radish pots each pot was given 5 radish seeds and the same happened for the onions except it was onion seeds. We also watered them and will water them again in another few days. We also labeled all of them so we could tell which one was drought, flood, and the control or the one that will be getting regular water.

MARCH 7:
Today my group and I checked for growth and found nothing so far. We also watered 40 milliliters of water for the two onion floods and the other two radish floods. The other 8 plants were in a good condition and we cannot water the droughts yet because we need them to dry out a little more first.

MARCH 11: Today we water all of our plants. The floods got 40 milliliters of water each, the controls got 25 milliliters of water each, and the droughts got 15 milliliters of water each. Then we measured them and all of the radishes had grown a little bit but none of the onions had grown at all. Also something surprising was that the droughts were growing faster than all of the others. The tallest one was the radish drought 2 and it was

9.1 centimeters. All of the plants are at least one centimeter tall besides the onions which have not grown yet.

MARCH 13: Today all we did was measure the height of our plants because we had originally messed up and had only done the tallest plant in the pot instead of what we were supposed to do and that was the average of all of the sprouts combined. We also moved the plants closer to the window so they could get some sunlight which they have not been getting a lot of recently. The onions have also finally sprouted and are still tiny but growing.

MARCH 15: Today we watered all of our controls and all of our floods. We will be watering our droughts on Monday. The controls got 25 milliliters of water and the floods got 40 milliliters of water. The droughts are still the tallest which still doesn't make sense to any of us and the onions have made massive progress with the tallest onion being onion drought number 1 and it is 6 centimeters tall. All of us will be entering our journals including Noah and Milo which me and Cait noticed that they did not do last Friday so we will make sure that they will do it this time. The droughts are looking a little bit dry and they have slightly changed color to a little lighter green. The floods are also looking a little rough and their growth seems to have slowed down a little bit then it had previously and they have changed color to a more darker green.

MARCH 18: Today we watered our droughts 10 milliliters of water each and when we checked on all of the radish droughts where in very poor health. They were leaning over on the side of the plant and were a very lighter green and looked very dried out and dieing. The floods also did not look very good but were doing a lot better than the radish floods. The onions are also making steady progress in growing and are doing very well and they do not seem to be as affected by the floods and the droughts as the radishes are doing.

MARCH 19: Today we watered all of our floods 40 milliliters of water and our controls 25 milliliters of water. The droughts are still not doing very well and the floods are also not looking very good but are still doing better than the droughts. The onions are also making very good progress in their growth and some have already grown over an inch in just one day.

MARCH 22: Today we watered our floods and our controls. Our floods where watered 40 milliliters each and our controls where watered another 25 milliliters each. After that we measured and most of our droughts are dead if not very close to death. Our floods are also somehow doing decently well. The controls are just over doing good and look the best out of all of the plants.

MARCH 25: Today we watered our drought plants 15 milliliters each. The onions are still growing but they do not look as well as they used to. The radishes are not doing very well either but the controls at least look better.

APRIL 1: Today after a week of being gone because of a problem with the facilities we watered all of our plants the controls got 25 milliliters of water, the floods got 40 milliliters of water, and the droughts got 15 milliliters of water. We also measured them and a lot of them had gone down because of them not having any access to water for a week.

Our Plants Height and Watered Intake

	R/C 1	R/C 2	R/D 1	R/D 2	R/F 1	R/F 2	O/C 1	O/C 2	O/D 1	O/D 2	O/F 1	O/F 2	Stuff
MARCH 7:	no	no	no	no	40	40	no	no	no	no	40	40	**Water (ml)**
MARCH 7:	0	0	0	0	0	0	0	0	0	0	0	0	**Height (cm)**
MARCH 8:	no	no	no	no	no	no	no	no	no	no	no	no	**Water (ml)**
MARCH 8:	0	0	0	0	0	0	0	0	0	0	0	0	**Height (cm)**
MARCH 11:	25	25	15	15	40	40	25	25	15	15	40	40	**Water (ml)**
MARCH 11:	7.9	4.3	6.7	9.1	6.1	1.8	0	0	0	0	0	0	**Height (cm)**
MARCH 13:	0	0	0	0	0	0	0	0	0	0	0	0	**Water (ml)**
MARCH 13:	10.6	11	11.6	14.2	12.6	10.3	1.6	.8	1	.7	1.6	.2	**Height (cm)**
MARCH 15:	25	25	0	0	40	40	25	25	0	0	40	40	**Water (ml)**
MARCH 15:	12.2	10	12	12.3	12.4	13.4	3.8	1.7	2.4	6	2.3	1	**Height (cm)**
MARCH 18:	0	0	15	15	0	0	0	0	15	15	0	0	**Water (ml)**
MARCH 18:	14.5	10	13	9.4	11.8	7.9	4.7	4.6	4.7	7.8	3.7	3.1	**Height (cm)**
MARCH 19:	25	25	0	0	40	40	25	25	0	0	40	40	**Water (ml)**
MARCH 19:	14	11.9	13.7	11.9	13.7	8	7.1	5.4	5.8	3.2	5.9	4.4	**Height (cm)**
MARCH 22:	25	25	0	0	40	40	25	25	0	0	40	40	**Water (ml)**
MARCH 22:	14.6	11.2	7.7	9.5	13.7	7.5	7.4	6.6	5.9	5.6	7.3	5.5	**Height (cm)**
APRII 1:	25	25	0	0	40	40	25	25	0	0	40	40	**Water (ml)**
APRII 1:	8.2	7.6	3.2	7	14.8	14.6	8.2	6.3	1.5	3	9.3	7	**Height (cm)**

Key:
R = Radish

O = Onion
D = Drought
C = Control
F = Flood