Kantonsschule Frauenfeld Class FSS

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Task 2 - Roots

How does the speed of the growth of cressroots variates subject to minerals in the water? The independent varaible is the composition of salts. The dependent variable is the speed of movement. The controlled variable include temperature, preparation of irrigation water and light intesity.

Abstract

The functions of a root are the detention and inclusion of nutrients , the detention of water and it anchor the plant in soil. The water and mineral salt intake is only in the root hair zone. Root hairs are thin, only a few millimeters long threads. They squeeze into the soil particles and increase by their huge numbers the root surface. Water is absorbed by osmosis into the root hair. The water particles migrate from the site of their high concentration (ground water) to the place of their low concentration (cell sap vacuole). Roots can also actively create a root pressure to get the water to the top. The root can leach the nutrient from the soil with three methods. The first method is the absorption of aquatic nutrients. The second proceeding is the transfer of an organic acid, which leach the mineral salt from the soil. The last possibility is that root gives out some hydrogen-cations to promote the exchange of ions. Furthermore, roots are a place synthesis for many plant hormones. In swamp or mud growing plants form roots systems, which supply the plant with oxygen.

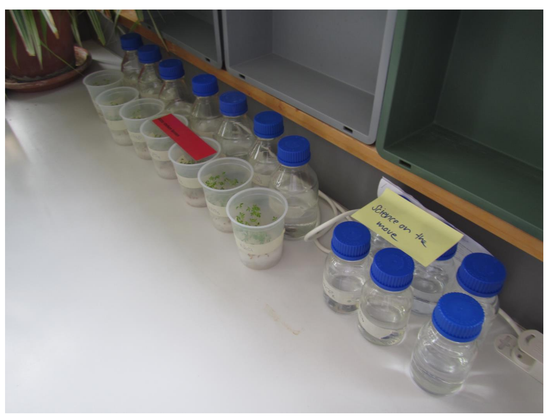

Figure1: Root laboratory

Methods

First basis fertilizer solutions are prepared. Six 200ml jars filled with distilled water are needed. In every single jar is one of the following salts included.
Salts: 5.0 g NaNO3/ 0.5g CaCl2/ 1.5g MgSO4/ 1.5g K2PO4/ 3.5g KH2PO4/ 0.5g NaCl
Next, seven glass jars filled with 470ml distilled water are needed. In one of these jars are all of the previously mentioned solution included. By the others is one salt basis fertilizer solution absent.
After this, cups are filled with fluffy absorbent cotton. In this case it is very important to look that the cotton is not compact, so it is easier to remove the roots. We recommend using absorbent cotton, which is usually used for pillows.
Next, it is important to label the cups with the substance, which is not included in the solution to avoid failures during the experiment. Now, the cotton is soaked with the right solution. The absorbent cotton should be wet.
Al least, the cress seeds are distributed over the absorbent cotton. Pay attention not to distribute them to close to each other, so they have enough space to grow and let the roots do their work. Now, the cups are placed at the right place. They should not be placed directly at the sun. However, they should have enough light. Have a look at the roots every day and check if the absorbent cotton is enough wet.

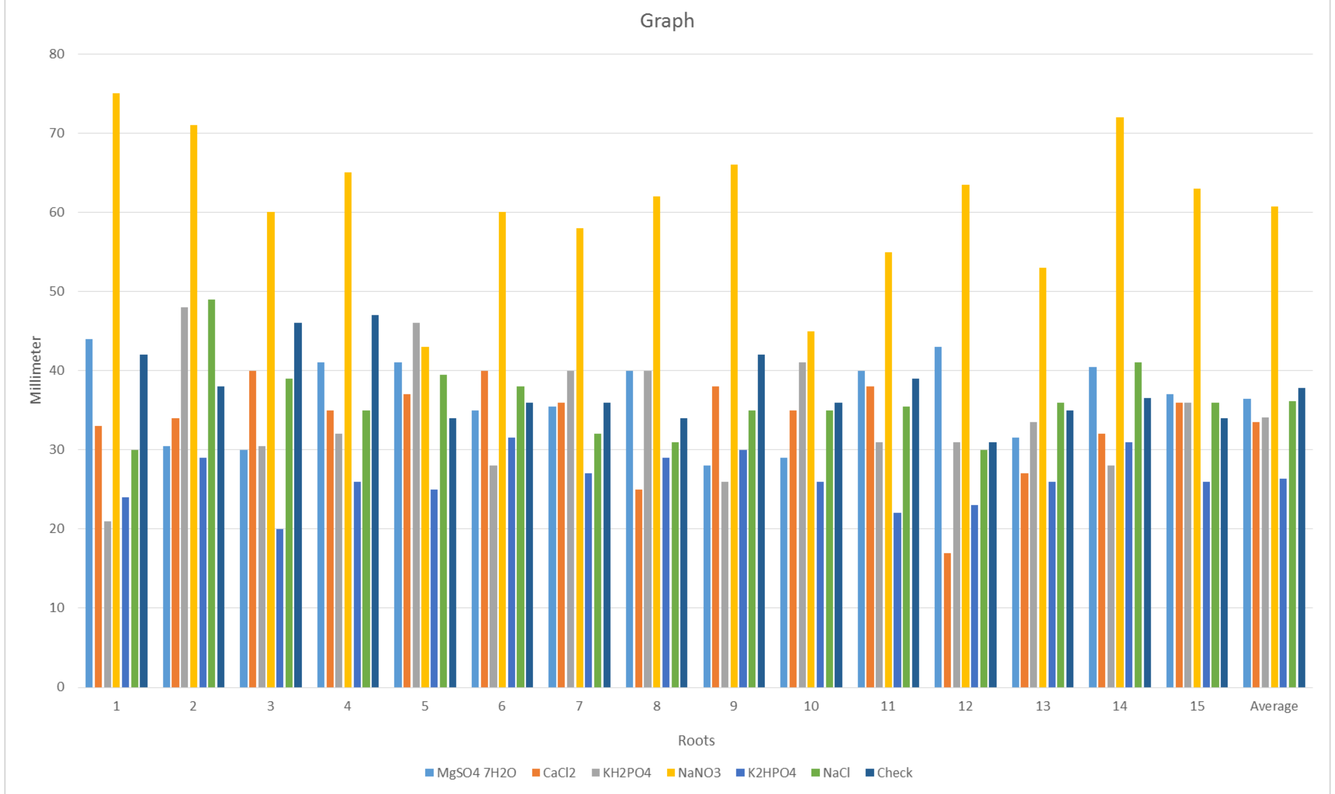

Figure2: Influence of different salts on the length of the root

Aspect 1

The length (mass in millimeter) of the different roots is indicated on this diagram. It is clearly visible that the yellow solution became the highest; insofar there are the longest roots. The plants, which had a lack of MgSO4 have in average the shortest roots. On the right, it is possible to compare the average results.
We suggest that the plants, which were raised without NaNO3, became the longest because this salt is the most necessary for the roots, so the rooting was much remarkable. The roots had to search for this substance, and did not get it. In contrast the roots, which were poured with the MgSO4-free solution are clearly shorter than the other roots. Therefore, we assume that this substance is the less necessary. The roots did not have to search for the salt because it was not indispensable for life.

Aspect 2: Evaluation

For the experiment we didn’t need much different devices and due for the simply structured lab. Nevertheless we received a meaningful result. The lack of time was definitely a problem. It was a shame that we didn’t carry it on for a longer time, because we would have more significant results. Our time problem wasn't based on bad or defective planning, it was caused by the other school pressure and it was difficult to meet each other, because we are not in the same classes. Another "disability" was the school holidays. In this case we had a week less for our experiment.
Precise work was by the production of the solution very necessary. With a capillary pipette and much patience we measured every single solution individual.

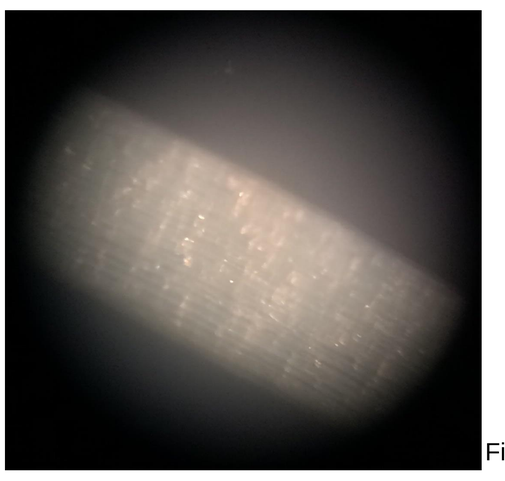

Figure3: cress-root under binocular

Aspect 3: Improving the investigation

- By the manufacturing, we should have used an electronic graduated pipette to guarantee the accuracy.
- We would have proved the result flawless if we had made a controlling test.
- Our result would probably be more exactly if every plant lab had become the same amount of solution.
- If we had measuring the pH-value, we would have received more useful data.
- Our experiment was a bit too long, so we had a time problem. Fortunately we obtained a result.
- We could have finished our experiment much earlier if we had used a faster growing plant.