

# Coffee / Caffeine Boosted Roots

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## Introduction

The shoot naturally has received more information than the root, for most roots are underground and therefore hidden from our sight. However, some roots grow above ground level, namely prop and aerial roots. The latter do not even touch soil but attach themselves to other plants or objects.

In general, roots absorb water and dissolved nutrients, serve as nutrient storage and anchor the plant. They also have the ability to release biochemical compounds that are either beneficial or toxic for organisms in its close neighborhood into the rhizosphere. Because of those substances, roots have a long history that is poisonous on the one hand, but live saving on the other.

The most common use of roots though is in agriculture. Cassava and sweet potato for example are used as staples, whereas carrots, radishes etc. are used as vegetables. Some - like ginger - are considered a spice. Roots can still be found in natural remedies and the longer the more in cosmetics as well.



## Guttation

A plant's roots play an essential part of Guttation, the process of emitting xylem sap from a plant's leaves, where the sap forms small droplets. When the relative humidity is high, usual transpiration does not occur (such as during nighttime, when the stomata are closed) and the soil is moist, water will enter the plant's roots to create a slight root pressure. This pressure causes sap to rise through the plant stem to the leaves, where the sap exits the plant and forms small droplets on top of or on the edges of the leaf.

## Design of our Experiment

### Aspect 1

„How does coffee and especially caffeine influence the rootedness of *lepidium sativum* (cress)?“

The independent variable was the amount of coffee/caffeine added; the dependent variable was decided on the strength of the roots measured with a spring newton meter. The controlled one was the time in between the measurements.

### Aspect 2

Cress seeds were grown in Petri dishes filled with 50 grams of earth. 12 dishes were set up. The first group of 3 Petri dishes was the control group, the second group was treated with grinded coffee containing 1.5% of caffeine, by mixing 50 grams of it with the earth of each of the petri dishes, the third with a high concentration of pure caffeine (0.15 g) and the last with a low concentration of caffeine (0.075 g). Those ingredients were added on a daily basis to the dishes during one week. 15 ml of water were added to each Petri dish per day.

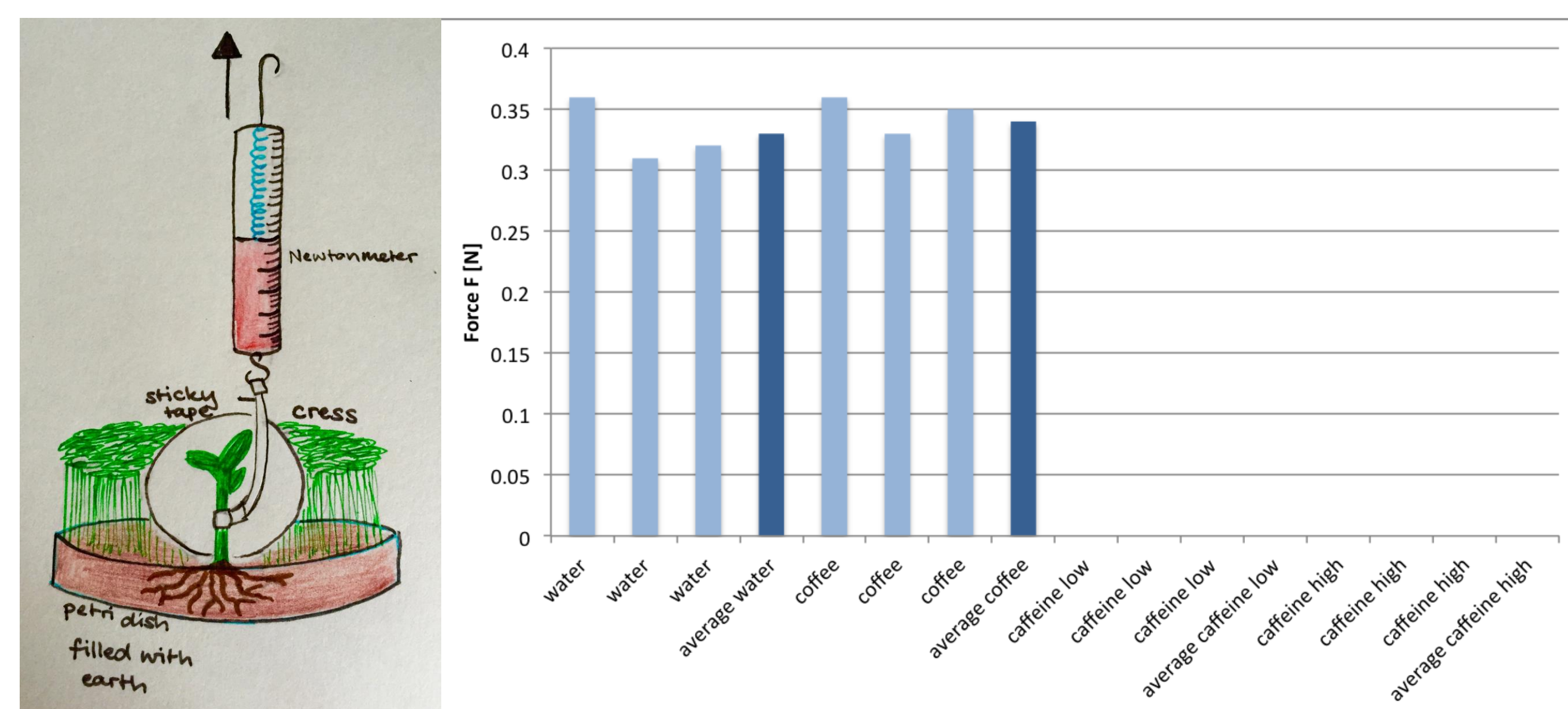
10 days after having planted the seeds, the measuring was started. The force needed to pull the cress out of the earth was measured with a spring newton meter, which was attached to one cress seedling with a piece of adhesive tape.

### Aspect 3

As the measuring was done with a newton meter, the collected data is expected to be accurate. Moreover there was one control group in the experiment and each measuring was performed three times.



## Data Collection and Processing



## Interpretation of results

We have seen that the roots only grew in the samples which were grown under normal conditions and in the samples which were grown in a mixture between soil and coffee. With the measurements it became clear that the roots in both samples grew to about the same strength. No roots grew at all in the samples which were watered with a caffeine solution.

In spite of the roots growing in both the water and coffee samples, less cress seeds opened in the coffee example. We concluded that growing the seeds with water is the best way to grow them. However, if you are only interested in the roots, you can also grow them in a mixture of coffee and soil.

## Reference list

- 1) How Stuff works - Article: "Root". Retrieved May 9, 2015 from <http://science.howstuffworks.com/dictionary/plant-terms/root-info.htm>
- 2) Flores, H. E. et al. 1999. "'Radicle' biochemistry: the biology of root-specific metabolism". Trends in plant science review, June 1999, Vol.4, No. 6. p. 220.
- 3) <http://en.wikipedia.org/wiki/Guttation>