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Investigating allelopathy

Planning

Allelopathy is an interaction between plants. It produces toxins which attack target plants, thereby inhibiting their growth and germination. The example of this which I am investigating is that between cucumber seeds and eucalyptus oil.

A suitable method for investigating the above is described in the literature. I am going to prepare a Petri dish with a cotton wool pad soaked in water. I will thoroughly wet the cotton wool pad and then turn the Petri dish upside down so that any excess water drips off. I will drip the eucalyptus oil into a small beaker which I will stand on the lid of the Petri dish, beside the Petri dish in a polythene bag. I will partially inflate the bag. It will be in a polythene bag so that the vapour cannot escape and to stop the cotton wool from drying out.

The variable which I will change will be the concentration of eucalyptus oil. I am going to do a preliminary experiment. I will, from this, decide on appropriate concentrations for the main experiment. I will control all the other variables: the cotton wool pads will have approximately the same amount of water, the bags will all be kept close together in the same place for the same time: the temperature will therefore be the same for all of them. I will get all the seeds from the same source and use the same number for all the tests

I predict, from the information in the literature, that the eucalyptus oil will inhibit the growth of the cucumber seeds. I also predict that the larger the concentration is, the shorter the hypocotyl will be.

For my preliminary test, I did the following concentrations of eucalyptus oil: 0, 8 and 15 drops. I put 10 seeds in each Petri dish. I used I got the following results:

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The results from my preliminary experiment go against the literature and my predictions, because they suggest that eucalyptus oil increases growth and germination. I predict that this will not be the case when the concentration is much greater than 8 or 15 drops. Therefore I am going to change the range of concentrations to the following: 0, 10, 20, 30, 40 and 50 drops. I will leave the remainder of the procedure the same as the preliminary test. I left the preliminary test for 7 days. I will do the same with the main experiment.

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Obtaining

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Analysing

The evidence shows that, in small concentrations, the eucalyptus oil helps the cucumber seeds to grow. However, in larger concentrations, it hinders their growth and I assume, after a certain concentration, it will prevent their germination in entirety. Their growth decreases as concentration of eucalyptus oil increases.

Conclusion: allelopathy hinders the growth of plants in large concentrations. This is because it produces toxins which attack the target plants. However, in very small concentrations it helps the plants to grow. The growth of the plants decreases as the concentration of eucalyptus oil increases.

My conclusion supports my prediction with the exception of the fact that allelopathy helps plants to grow in smaller concentrations.

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Evaluating

The evidence I obtained had a wide range of growths therefore was not too reliable. It had the following ranges:

These ranges are very high; in some cases larger than the average growth itself. There were a few anomalies which of course distort the range, so a better way to find out the reliability of the experiment would be to ignore these and then work out the range.

The anomalies were the following: 21 and 48mm for 10 drops of eucalyptus oil; 31mm for 20 drops and 9mm for 50 drops. Having eliminated these, the ranges now stand at:

This is greatly improved so excluding the anomalies the reliability of the experiment was not too bad.

I think the experiment worked well on the whole but if I were to repeat it I would make sure all the cotton pads were soaked with the same amount of water as this may have affected the growth of the cucumber seeds.

I believe the evidence is sufficient to support my conclusion as, excepting the anomalies, the trend lies as stated: firstly helping the seeds to germinate and grow and finally hindering their germination and growth more and more as the concentration increases.

For further work I would use different seeds to see if their germination and growth is affected by eucalyptus oil more, less or the same amount as cucumber seeds.