

Effects of allelopathy in plants



**ASSIGN
BUSTER**

What do we learn about the effect of allelopathy in plants, in particular the effects that garlic and broccoli have on the growth of other plants?

1. State the problem.

We are going to find out whether garlic volatiles or broccoli volatiles affect celery growth and if they do, how much do they hinder their growth.

2. State your hypothesis.

The presence of garlic volatiles inhibits celery growth, but the presence of broccoli volatiles has no affect.

3. What are you going to measure (dependent variable)?

Growth of celery seeds in the presence of garlic volatiles.

Growth of celery seeds in the presence of broccoli volatiles.

4. What experimental variable are you investigating?

Growth of celery seeds without garlic present.

Growth of celery seeds without broccoli present.

5. What treatment(s) will you use?

Group PG1: Celery with garlic, Group PG2: Celery without garlic

Group PB1: Celery with broccoli, Group PB2: Celery without broccoli

6. Do you need a control? If not, then why not? If so, what is it?

We do need a control group. If we do not have a control group, we will not be able to measure the growth of “ celery with garlic” (and “ celery with broccoli”) and compare it to anything else. The control group for each study allows us to make a good comparison.

7. What nuisance variable(s) will you be stabilizing? How will you stabilize each one?

Temperature, water, sunlight. Temperature of all seeds will be the same because they are placed in a common location. Sunlight will be present for all seeds and absent for all seeds at the same time. Water: when added, will be added in the same amount at the same time for all seeds.

8. What sample size will you use?

A sample size of 20 seeds of celery will be used in each of the four groups.

9. Will you replicate your study? If yes, then how? If not, then why not?

We will replicate our study because each group consists of a sample size of 20 seeds, so we are replicating by comparing the results for 20 occurrences.

PURPOSE:

We will measure the growth of celery in the presence and absence of garlic volatiles. We expect that growth will be inhibited by garlic volatiles. We will also measure the growth of celery in the presence and absence of broccoli volatiles, but we expect broccoli to have no effect.

INTRODUCTION:

Allelopathy (from the Greek, allelon, meaning another and pathos, which means to suffer) is a way some plants deal with competition.

Allelopathic plants release chemical substances which literally make other plants suffer. Some of these allelopathic plants store toxins in their leaves. When the leaves fall to the ground, the toxins are released. These toxins leach through the soil and are taken up by other nearby plants.

Alternately, allelopathic plants can release chemicals through their roots.

These toxins travel through the soil where they can be absorbed by the roots of other plants.

Some allelopathic plants use gas warfare by releasing allelochemicals through small pores in their leaves and gassing nearby species.

We will conduct two experiments simultaneously. In one experiment, we will be using garlic volatiles to find out if the gases they emit negatively affect the growth of celery seeds. In the second experiment, we will use broccoli volatiles instead of garlic volatiles.

METHODS:

We took 4 petridishes, put a filter paper at the bottom of each and added about 2 ml of water to each one. In one petridish we placed a portion of crushed garlic in the center, placed in a piece of aluminum foil. This would be compared with a petridish in which the piece of aluminum foil had no crushed garlic on it. Similarly, we had a petridish with and without crushed broccoli. The labeling and contents of each petridish were as follows:

PG1 = petridish with crushed garlic (experimental group 1)

PG2 = petridish without crushed garlic (control group 1)

PB1 = petridish with crushed broccoli (experimental group 2)

PB2 = petridish without crushed broccoli (control group 2)

We carefully placed 20 celery seeds in each petridish, evenly distributed along the filter paper around the center. We covered all four petridishes and taped them along the sides, to minimize loss of moisture.

Over the next 2 weeks, we measured the growth of celery seeds in each petridish. If water had dried up, we added the same amount of water to each and continued to record the growth.

DATA AND RESULTS:

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EXPERIMENTAL GROUP 1 (PG1)

CELERY SEEDS WITH GARLIC

Date of Observation Parameter measured

Number of seeds germinated and growing Comments

01/07/10 no growth observed Less than 24 hours has passed

01/11/10 5 out of 20 have shoots

01/12/10 5 out of 20, a couple sprouts Added 1 ml water

01/13/10 8 out of 20, 5 have leaves

01/14/10 8 out of 20, 5 growing longer Added 1 ml water

01/19/10 6 out of 14, remaining seem rotten

CONTROL GROUP 1 (PG2)

CELERY SEEDS WITHOUT GARLIC

Date of Observation Parameter measured

Number of seeds germinated and growing Comments

01/07/10 no growth observed Less than 24 hours has passed

01/11/10 10 out of 20 have shoots

01/12/10 13 out of 20, all showed stems, separated from seeds Added 1 ml water

01/13/10 13 out of 20, stems growing longer

01/14/10 18 out of 20, stems intertwined Added 1 ml water

01/19/10 20 out of 20 all growing

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EXPERIMENTAL GROUP 2 (PB1)

CELERY SEEDS WITH BROCCOLI

Date of Observation Parameter measured

Number of seeds germinated and growing Comments

01/07/10 no growth observed Less than 24 hours has passed

01/11/10 13 out of 20 have little stems

01/12/10 19 out of 20, longer stems, more sprouts Added 1 ml water

01/13/10 16 out of 20, 11 sprouted and growing, 5 germinated w/no stems

01/14/10 16 out of 20 Added 1 ml water

01/19/10 17 out of 20

CONTROL GROUP 2 (PB2)

CELERY SEEDS WITHOUT GARLIC

Date of Observation Parameter measured

Number of seeds germinated and growing Comments

01/07/10 no growth observed Less than 24 hours has passed

01/11/10 17 out of 20 have long white stems with green leaves Very quick growth!!!

01/12/10 17 out of 20, all growing longer fast Added 1 ml water

01/13/10 17 out of 20, no room to grow, tangled

01/14/10 17 out of 20 Added 1 ml water

01/19/10 17 out of 20

CHARTS/GRAPHS: (attached)

DISCUSSION:

It is very obvious that garlic volatiles adversely affected ability of celery seeds to grow. Even those that sprouted seemed to rot quickly.

As far as broccoli, the results are not so clear. Even though the seeds on the dish with broccoli grew slower than the one without broccoli, they did eventually grow and some grew better in broccoli than without broccoli. This part of the experiment would need to be repeated to come to a decision on whether broccoli inhibited the growth of celery seeds or not. It is even possible that broccoli may help celery to thrive.

Work Cited

Witt, Jon. Soc.. 1st ed. New York, NY: McGraw-Hill, 2008. 67-68. Print. (use this for format only)

<http://www.suite101.com/blog/bobcajun/allelopathy>

Jan 19, 2008 Alleleopathy posted by Robert Dailey