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# INTERSPECIFIC COMPETITION WITH BASIL SEEDS AND MATURE MINT PLANT

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## ABSTRACT

A plant's growth highly depends on the quality and quantity of resources it is provided with. The soil that a plant is grown in provides many of these resources, but can be limited when competing for those resources with other plant species. This experiment aims to investigate whether interspecific competition between mature *mentha x suavis* and *ocimum bacilicum* affects the timing of germination of *ocimum bacilicum* seeds. Basil seeds were placed alone in the center of 5 pots, and another 5 pots contained basil seeds alongside a mature mint plant. The number of new sprouts emerging per day were recorded. Results show that overall, basil sprouts emerged earlier when potted alone than when potted with mint, confirming our hypothesis that interspecific competition plays a role in seeds' ability to germinate.

*Keywords: interspecific competition, mentha x suavis, ocimum bacilicum, competitive exclusion principle*

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## INTRODUCTION

Seeds utilize resources from the soil that they are in, but competition from surrounding plants using the same soil may affect the rate at which they germinate. Light is abundantly given throughout the day, however nutrients from the soil are limited. Interspecific competition is when individuals of different species compete for the same resources within an ecosystem. The two plant species used in this experiment are *mentha x suavis* commonly known as mint and *ocimum bacilicum* commonly known as basil. These two herbs serve as ideal organisms for this experiment because they can be watered the same amount and exposed to the same amount of sunlight throughout the day. The aim of this experiment is to see whether basil seeds planted alone with mature, causes a delay in germination as a result of interspecific competition. We hypothesize that basil seeds potted alone will germinate quicker than basil seeds potted with mint.

## MATERIALS AND METHODS

I purchased 10 clay pots with a diameter of 4.25 inches, basil seeds, 5 mint plants, and an 8 quart bag of miracle-gro seed starting potting mix. I labelled the pots 1 through 10, and planted 10 basil seeds in the center of pots 1 through 5. For pots 6-10, I planted a mint plant where the largest stem was an inch away from the edge of the pot. 10 basil seeds in pots 6-10 were planted 0.5 inches away from the opposite edge. Pots were placed outside with consistent direct sunlight and water. Each pot was watered enough to keep the soil moist (usually 2 times per day), per instructions on the miracle-gro package. All pots were kept outside, even when it rained.

Basil seeds typically take up to 2 weeks to germinate. Germination was defined as the time that the basil first emerges from the soil. With the assumption that basil seeds potted with mint would take longer to germinate, the data collection period was 18 days long. Data collection started on Thursday, April 9<sup>th</sup> at 4:30 PM and ended on Monday, April 27<sup>th</sup> at 4:30 PM, in which the number of new sprouts for each pot were counted and documented.



**Figure 1.** Set up of experiment on Day 1. The first row (pots 1-5) contain basil seeds potted alone. The

second row (pots 6-10) contain basil seeds potted with a mature mint plant.

## RESULTS

Overall, basil seeds potted with mint germinated later than those potted by themselves. Data was compiled into the 2 tables below, which show the number of new sprouts appearing each day for basil seeds alone (pots 1-5) and for basil with mint (pots 6-10). Sums of new sprouts each day were totaled. A single-tailed paired t-test was done with a 95% confidence interval. We received a p-value of 0.0196.  $p < 0.05$ , thus we fail to reject our hypothesis.

**Table 1:** New sprouts per pot for basil seeds planted alone for 18 days

| <b>Basil Alone</b>  |       |       |       |       |       |       |
|---------------------|-------|-------|-------|-------|-------|-------|
| New sprouts per day | pot 1 | pot 2 | pot 3 | pot 4 | pot 5 | TOTAL |
| Day 1               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 2               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 3               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 4               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 5               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 6               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 7               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 8               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 9               | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 10              | 1     | 0     | 0     | 0     | 2     | 3     |
| Day 11              | 0     | 0     | 1     | 0     | 0     | 1     |
| Day 12              | 1     | 0     | 0     | 0     | 1     | 2     |
| Day 13              | 1     | 0     | 1     | 1     | 1     | 4     |
| Day 14              | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 15              | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 16              | 1     | 0     | 0     | 0     | 0     | 1     |
| Day 17              | 0     | 0     | 0     | 2     | 2     | 4     |
| Day 18              | 0     | 0     | 1     | 1     | 1     | 3     |

**Table 2:** New sprouts per pot for basil seeds planted with a mature mint plant for 18 days

| <b>Basil and mint</b> |       |       |       |       |       |       |
|-----------------------|-------|-------|-------|-------|-------|-------|
| New sprouts per day   | pot 1 | pot 2 | pot 3 | pot 4 | pot 5 | TOTAL |
| Day 1                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 2                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 3                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 4                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 5                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 6                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 7                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 8                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 9                 | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 10                | 0     | 0     | 0     | 0     | 0     | 0     |
| Day 11                | 0     | 0     | 0     | 1     | 0     | 1     |

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|        |   |   |   |   |   |   |
|--------|---|---|---|---|---|---|
| Day 12 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day 13 | 1 | 0 | 0 | 0 | 0 | 1 |
| Day 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day 15 | 0 | 0 | 0 | 1 | 0 | 1 |
| Day 16 | 0 | 1 | 0 | 0 | 0 | 1 |
| Day 17 | 0 | 0 | 0 | 0 | 0 | 0 |
| Day 18 | 0 | 0 | 0 | 0 | 0 | 0 |

## DISCUSSION

The results from this experiment confirm that seeds of *ocimum bacilicum* germinate quicker when they are not competing with nutrients in the soil with mature *mentha x suavis*. Because the mint was already mature, it was better able to obtain the necessary nutrients to sustain itself, thus preventing the basil seeds from obtaining resources to germinate. To further our understand of the mechanisms of interspecific competition, we can perform this same experiment with two mature plants. Through our knowledge of the competitive exclusion principle, we can expect that the two species will not be able to coexist, and one species will be more capable of obtaining the limiting resources.

## LITERATURE CITED

Turkington, Roy, et al. "Interactive Effects of Nutrients and Disturbance: An Experimental Test of Plant Strategy Theory." *The Ecological Society of America*, John Wiley & Sons, Ltd, 1 Apr. 1993, [esajournals.onlinelibrary.wiley.com/doi/epdf/10.2307/1940812](http://esajournals.onlinelibrary.wiley.com/doi/epdf/10.2307/1940812).