

Does Fertilizer Really Help A  
Plant Grow?

# Hypotheses

Hypothesis: I predict that the mung beans that are grown in fertilizer will sprout sooner than the mung beans grown without fertilizer. In addition, I predict that the mung bean plants that are grown using fertilizer will grow taller and have larger leaves than without fertilizer.

# Background Research [part 1]

## **What is a mung bean?**

The mung bean is in the pea family (1). The seed and sprouts are both edible. In addition, mung beans can be used as a cover crop to reduce soil erosion or to feed livestock (2).

## **What is fertilizer?**

Fertilizers can be used to give a plant the essential nutrients it needs to develop and grow (3). Fertilizer enhances the growth of many plants (4) The main nutrients that fertilizers have are nitrogen (N), phosphorus (P), and potassium (K) (3). Fertilizer helps retain water in the soil and helps air flow through to the roots (4)

# Background Research [part 2]

**What does the germination and growth of a mung bean look like?**

The first stage of growth is germination of the seed (5-7). Germination is when the seed absorbs water from the soil and causes expansion of cells in the seed embryo. In the post-germination stage, the stem and leaves (cotyledons) come out of the bean into the seed bed and eventually emerge from the soil. The last part is maturation, where the stem of the plant becomes longer and thicker and leaves get wider and longer, until the adult plant is formed (5-7).



# Materials

## **Mung beans.**

Organic dried mung beans (*Vigna radiata*) were purchased at a local grocery store (Sprouts). They were kept dry until use.

## **Soil and fertilizer.**

Mung beans grow best in a moist (but not too wet) and sandy loam soil (8, 9). Vigoro All-Purpose Potting Mix was obtained from a local garden center (Home Depot). In addition, a commercially available soil with fertilizer (Miracle-Gro Indoor Potting Mix) was bought at Home Depot. The Miracle-Gro soil contained 0.25% total nitrogen, 0.13% available phosphate, and 0.19% soluble potash (potassium).

# Procedures

There were two groups of mung beans in this experiment. In one group, the control group (group C), nothing was added to the soil containing the beans. In the second group, the treated group (group F), mung beans were planted in soil containing the fertilizer. The seeds were germinated in water for 2 days, until a sprout appeared. The sprouted beans were planted 2 cm deep in soil contained in a small plastic cup (four seeds per cup). The same amount of water (to moisten the seeds, but not overwater them) was added to both groups. The planted seeds were exposed to light from a 60 W light bulb.

# Measurements.

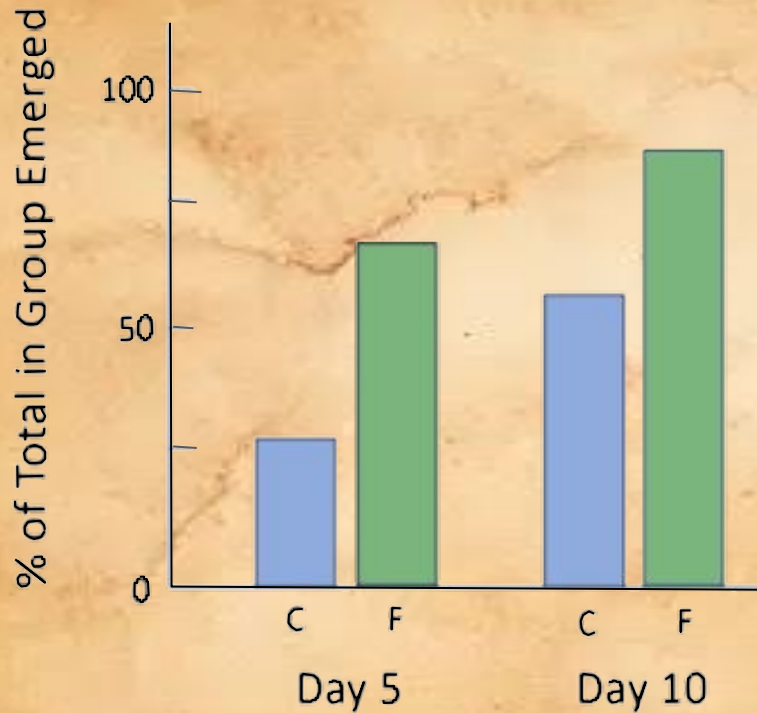
The following measurements were made on a daily basis:

- 1) Time for the initial sprout to appear out of the soil (called "Emerge" in the data set);
- 2) The height of the plant stem above the soil line.
- 3) The size of one leaf that formed on the plant.

The data were collected for each of the plants (12 plants per group) and the averages were compared between the two groups (group C vs. group F) (Figures 1-3).



Figure 1. Effect of Fertilizer on Mung Bean Emergence

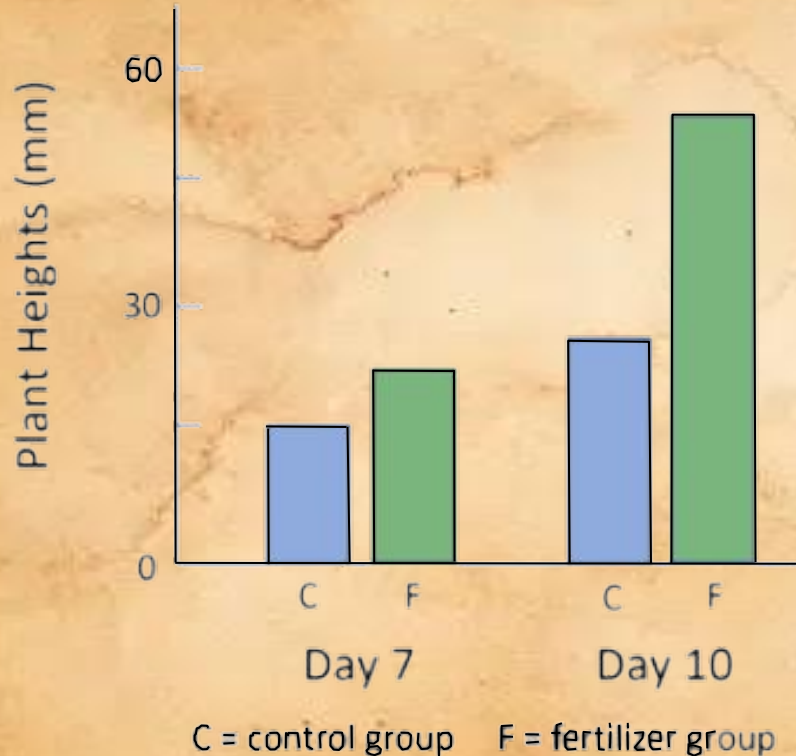


C = control group    F = fertilizer group

**Figure 1** shows the percentage of the plants that emerged from the soil in the control group (group C) and in the fertilizer group (group F) after 5 or 10 days. The data show that at both day 5 and day 10 there were more plants in the fertilizer group that emerged than in the control group.

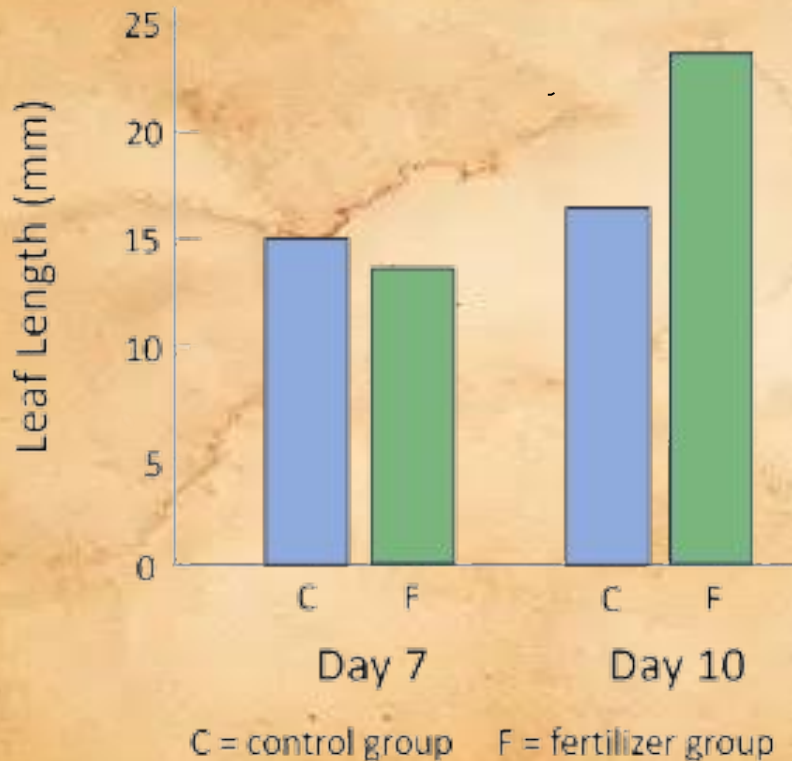


Figure 2. Effect of Fertilizer on Mung Bean Plant Heights



**Figure 2** shows the heights of the plant stems in the two groups at days 5 and 10. It is clear that the plant stems were longer in the fertilizer groups, especially at day 10.

Figure 3. Effect of Fertilizer on Mung Bean Leaf Lengths



**Figure 3** shows the leaf lengths in the two groups at day 7 and day 10. At day 7 there really weren't any major differences in the two groups. However, at day 10, the leaf lengths in the fertilizer group were a lot bigger than in the control group.

# Conclusions

- Based on the results, we can make these conclusions. The results can be used to accept the first hypothesis, that the fertilizer caused the planted mung beans to emerge from the soil faster than the mung beans in the control group.
- The results also support the hypothesis that the fertilizer caused greater growth of the mung bean plant stems than in the control group.
- Finally, the results support the hypothesis that having fertilizer in the soil caused the leaves to grow longer than without fertilizer.
- The take-home message from this experiment is that someone wanting to grow mung bean plants should have fertilizer in the soil they plant the mung beans in.



# Citations

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