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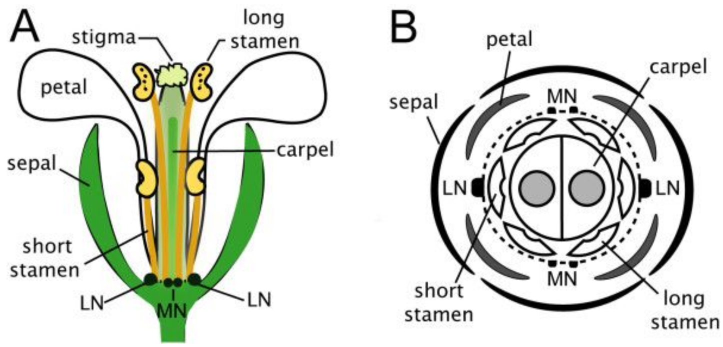
Experiment Proposal

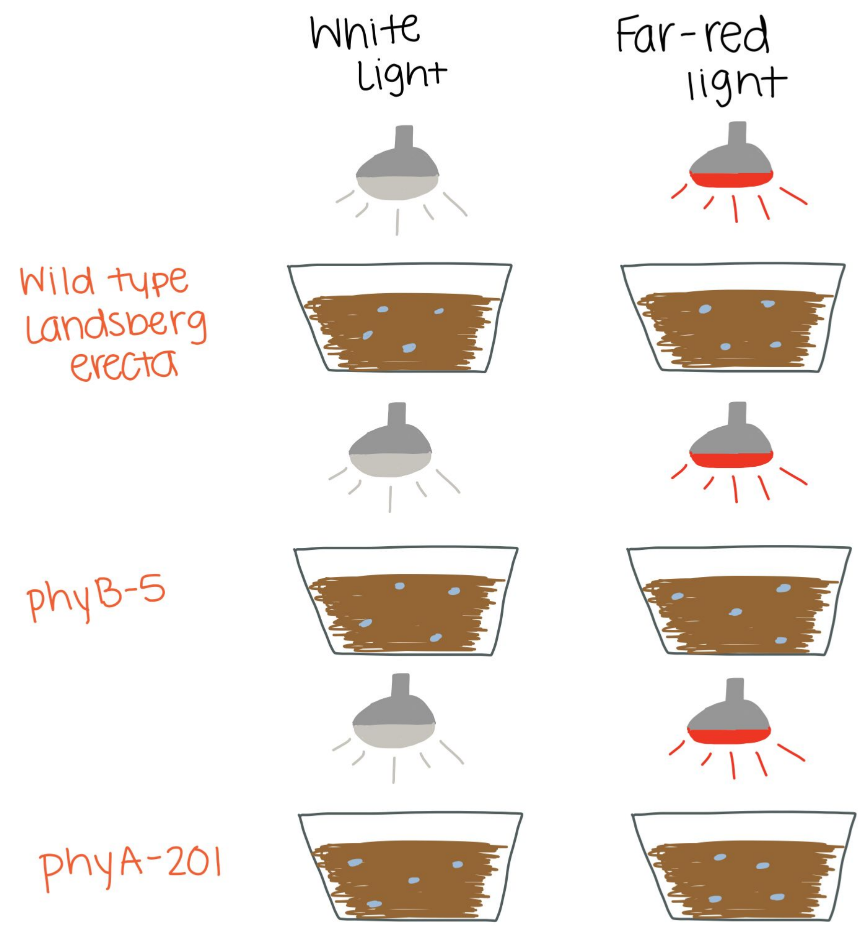
1. Research Report
    a. Arabidopsis thaliana is a flowering plant that is often used for educational purposes because of its petite physical size and rapid life span (Minx).
        i. 

(Kram et al.). This illustration depicts the flower portion of the plant. However, Arabidopsis thaliana also includes a lean stem, plentiful leaves, and expanded roots.
        ii. There are two rather unique physiological characteristics in Arabidopsis thaliana. One includes the fact that the flowers of this plants are hermaphrodite, containing both male and female organs. Even though this plant is self-fertile, there are instances when insects help pollinate to other plants nearby (Minx). The other process is what our mutants focus on more. This activity is called photomorphogenesis, which is light-regulated plant development (Shinkle).
        iii. The ecology of Arabidopsis thaliana is rather broad. This plant grows in a variety of conditions since it can tolerate either sand-like soil or clay-like soil. Additionally, Arabidopsis thaliana can grow in either no shade or partial shade, and in dry or moist soil (Minx).
        iv. The mutations, phyB-5 and phyA-201, greatly impact the wild type and its photomorphogenesis. Depending on the type of light the mutated plants are placed in, the hypocotyls will vary in length and the cotyledons will be dispersed differently with each mutant. Wild type Landsberg erecta needs photomorphogenesis to grow. However, mutants phyB-5 and phyA-201 have deficiencies in their phytochrome photoreceptor gene and so will not accomplish photomorphogenesis easily.
    b. The gap in our study we plan on researching involves the intensity of the light. We intend to place our plants in different intensities of light as well as different types of light.

            i. Just because a plant is in the “right” type of light does not automatically conclude that the plant will grow to its full potential. One also needs to consider the amount of light that the plant receives.

   c. Our specific plant research may be incredibly useful one day. Whenever new towns and cities spring up, they bring buildings and infrastructure with them. Since previously available vertical space is now being used, numerous plants are etiolating due to insufficient sunlight. Our research may be found useful by modern scientists who are researching if plants can be grown to their full potential by an alternate light source.
   d. The information gained from this study can help the sustainability of countless organisms. If we conclude that there *are* other possible alternatives instead of natural light that provide the equivalent advantages that sunlight does, we may apply that to other vegetation that are food sources for countless organisms.
   e. Kram, Bryan W., et al. "Uncovering the Arabidopsis Thaliana Nectary Transcriptome: Investigation of Differential Gene Expression in Floral Nectariferous Tissues." *BMC Plant Biology*. *BioMed Central*, bmcplantbiol.biomedcentral.com/articles/10.1186/1471-2229-9-92. Accessed 5 Oct. 2017. Originally published in *BMC Plant Biology*, vol. 9, 15 July 2009.
      Minx, Patrick. "Genome: Arabidopsis Thaliana." *Washington University in St. Louis*, McDonnell Genome Institute, 2014, genome.wustl.edu/genomes/detail/arabidopsis-thaliana/. Accessed 5 Oct. 2017.
      Shinkle, James. "Basic Photomorphogenesis." *Photobiology*, 4 Apr. 2016, photobiology.info/Shinkle.html. Accessed 5 Oct. 2017.

2. Research Question
   a. Our aim in this study is to see how different phytochromes in our mutated Arabidopsis thaliana plants react to contrasting types of light. The kinds of light we intend to use is white and far-red light.
   b. We will grow our mutated plants (phyB-5, phyA-201) in white and far-red light and observe their reactions to see whether plants are capable of surviving in different types of light.
3. Research Methods
   a. Our null hypothesis is that plants can only grow sufficiently in white light. Our alternative hypothesis is that plants can, in fact, grow in multiple types of light, not only white light.
   b. We will plant our Arabidopsis thaliana seeds in different types of light (white and far-red) and observe the results by measuring the hypocotyls and counting the cotyledons.
   c. Experimental Design



i.

ii. Materials - Arabidopsis thaliana mutant seeds (phyB-5, phyA-201), wild-type seeds, soil, planting containers, white light, far-red light, water, ruler.

iii. The independent variable in our experiment is the type of light that the plants are exposed to. The dependent variables are the hypocotyl lengths and the number of cotyledons. There are countless controlled factors in our experiment including temperature, water moisture, soil amount, air quality, number of seeds, and time provided to grow.

iv. Procedure

1. Setup: Place 1 cup of soil in each container. Distribute an equal amount of phyB-5 seeds in each container. Repeat with phyA-201 seed mutants and the wild type seeds in their own containers.
2. Experimentation: Place one container with each mutant seed (3 in total) in white light. Repeat with far-red light. Water

regularly and observe plants for one week. After one week, with a ruler, measure all the hypocotyls and count the cotyledons and record.

d. To evaluate whether or not our hypothesis is supported by our data, we will measure all our plants’ hypocotyls and count their cotyledons to then compare the numbers of mutant plants to the numbers of wild type plants.