Effect of the Mutation PhyB in *Landsberg Erecta*

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BACKGROUND INFORMATION

In *Landsberg Erecta,* the gene that regulates shade avoidance is *Phytochrome B*
Phytochrome B regulates etiolation which is shown by elongated stems and smaller leaf area.
To represent shade, we used red light.
Red light has between 635-800 nanometers depending on close or far red light.

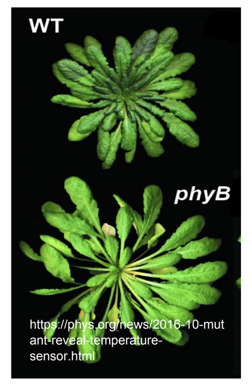

Figure 1: the difference in leaf area is demonstrated between the wildtype and mutant.

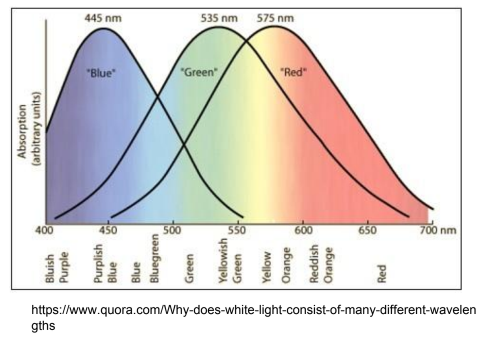

Figure 2: Wavelength chart that shows the nanometers of different lights

OUR EXPERIMENT:

In our experiment we used 3 different types of light:

1. Far Red Light (800 nm)
2. Close Red Light/Red Film w/ White Light (700-635)
3. White Light

Figure 3: Mutant (Left) and WT (Right) in Close Red Light

HYPOTHESIS:

If we place the mutation of *Landsberg Erecta*: *Phytochrome B* in red light, it will not etiolation like the wild type, meaning the mutation's leaves will be larger and the stem will be shorter.

PROCEDURE:

Figure 6: close red light (700-635 nm)(white light with red film)
Planting containers with jiffy pods of wildtype and mutant seeds

Experimental Design:

Independent Variable:
Wavelengths of Light
(White Light with Red Film, Red Light and White Light)

Dependent Variables:
- stem length (mm)
- leaf area (cm squared) measured using Image

Controls:
- amount/type of water
- fertilizer
- amount of light

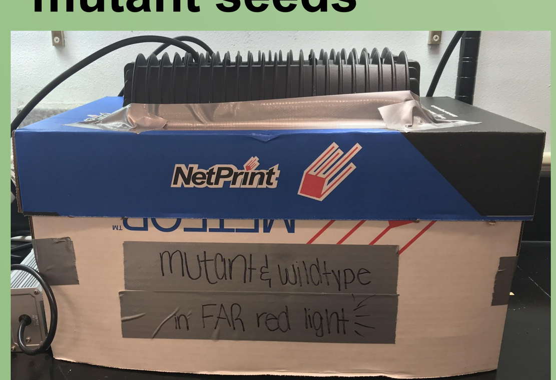

Figure 5: far red light (800nm) setup with planting containers and jiffy pods with wildtype and mutant seeds

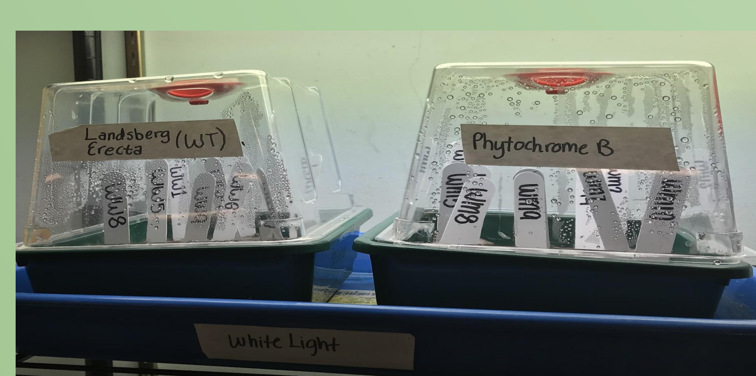

Figure 4: White Light Planting containers with jiffy pods of wildtype and mutant seeds

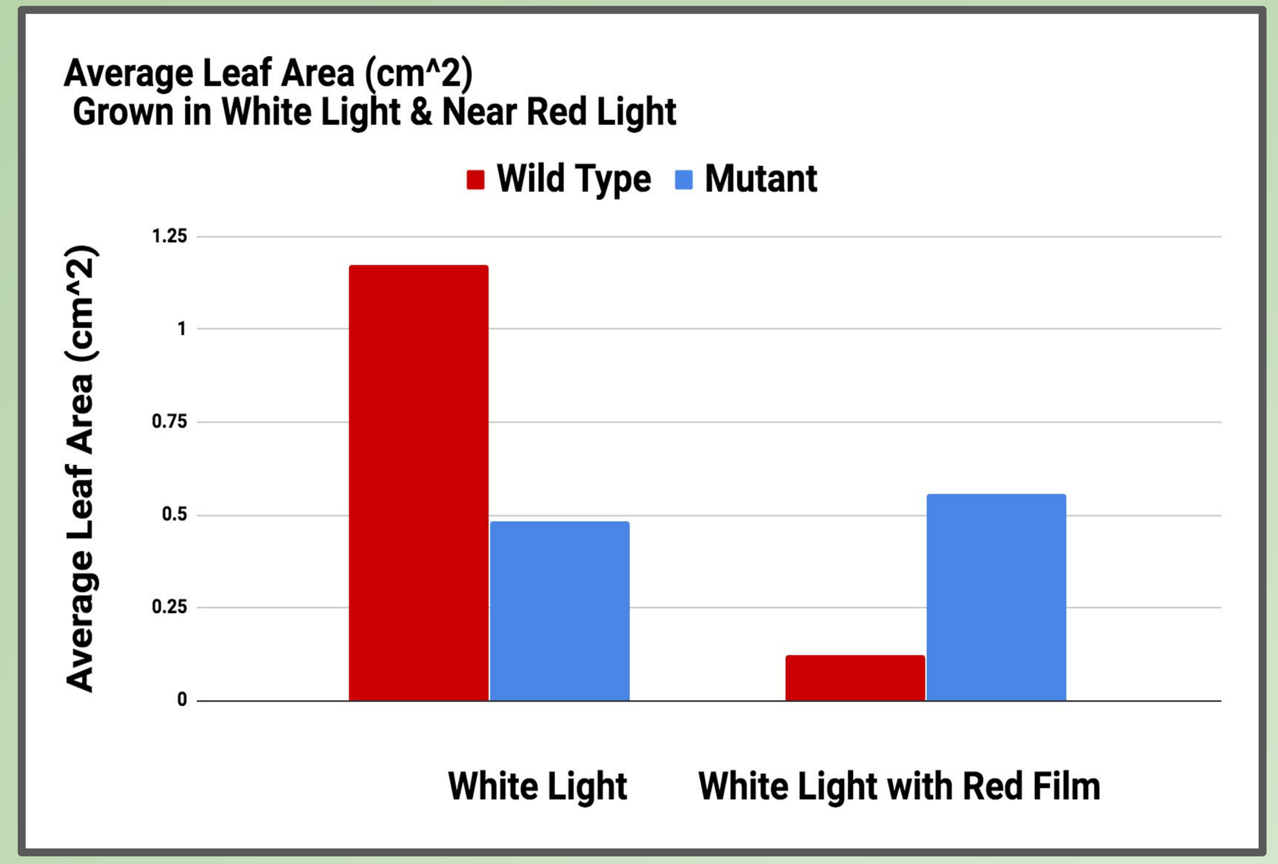

Figure 9: Shows difference in leaf area of wild type & mutant in both white and near red light.

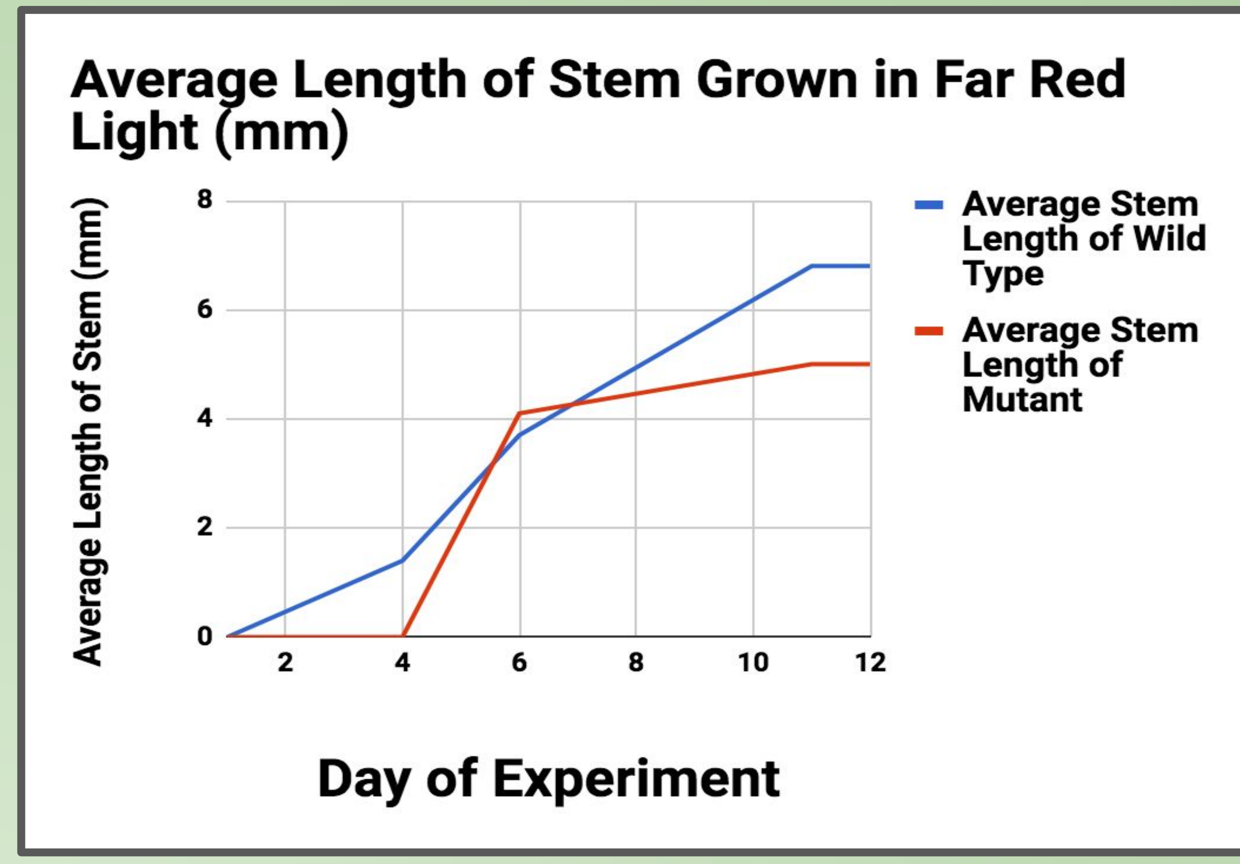

Figure 10: Shows the average stem length of the plants in far red light

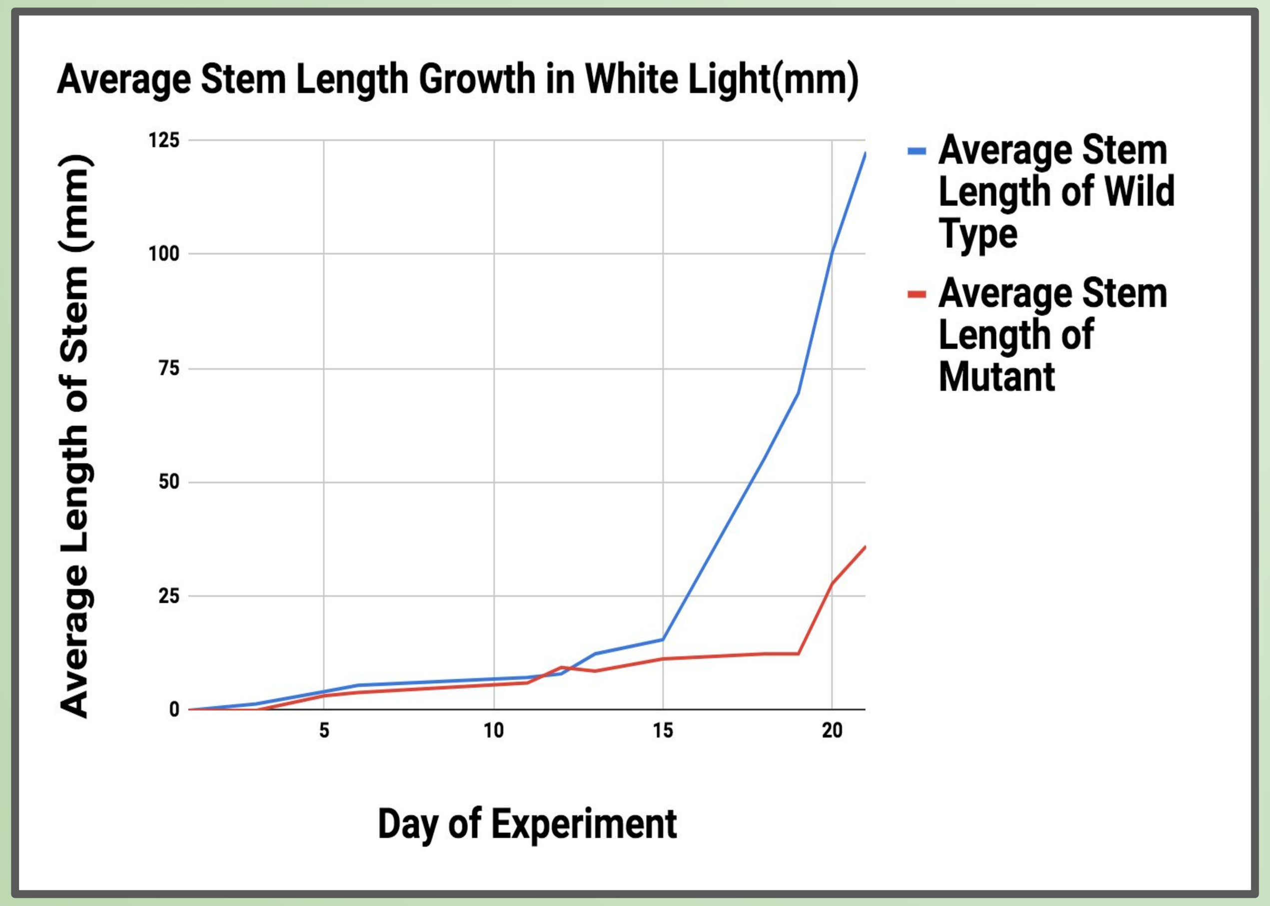

Figure 11: Shows stem length difference between wild type & mutant in white light.

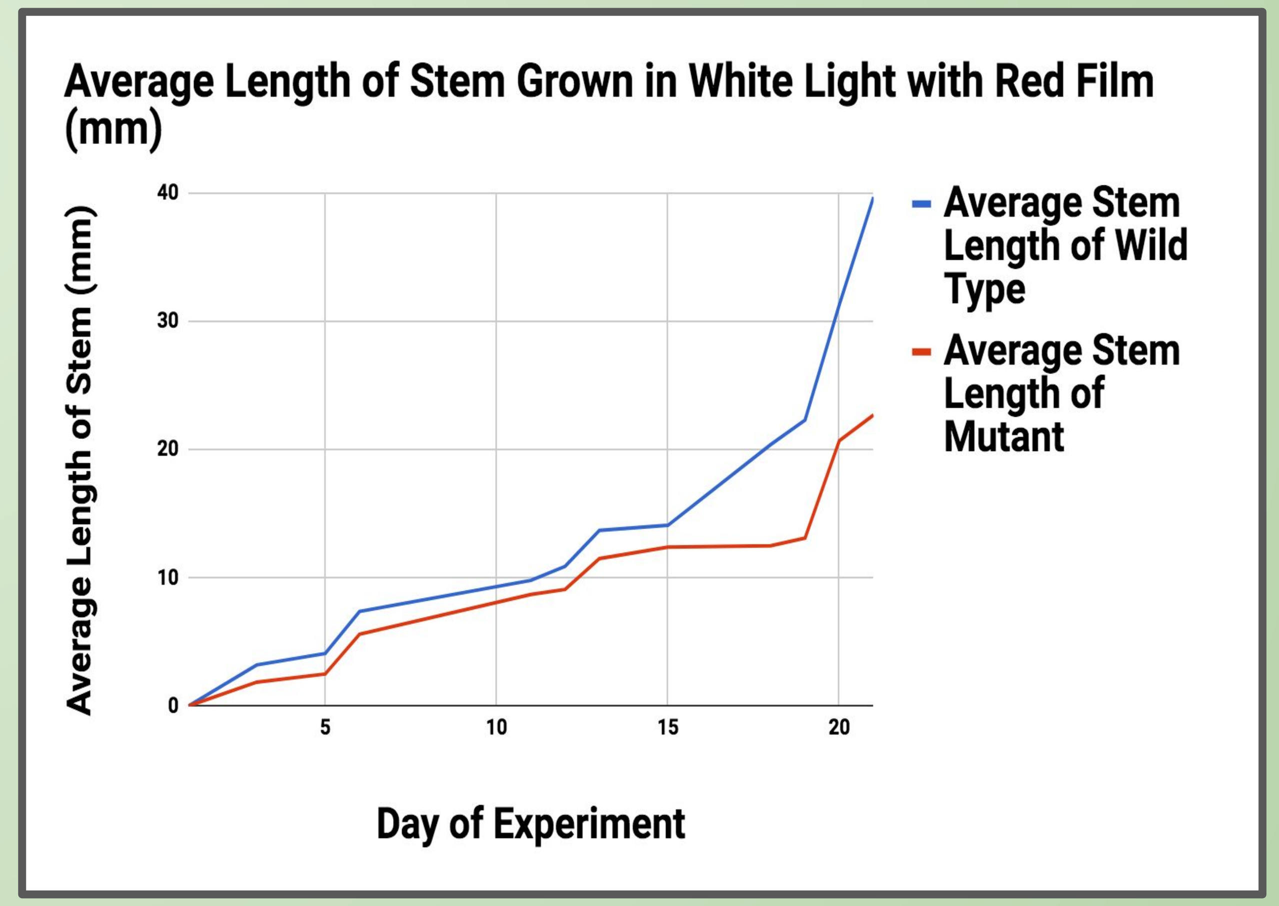

Figure 12: Shows the difference in stem length of wild type & mutant in near red light

Figure 7: Red light mutant (left) and wild type (right) demonstrating minimal to no growth halfway through experiment

ACKNOWLEDGEMENTS

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Ms. Beardsley, our AP Seminar instructor, guided us to obtain the research and data needed for this experiment.

Figure 8: Rosette leaves, the leaves at the bottom which demonstrate photosynthesis the most.

RESULTS

-In the close red light setup, the stem growth was longer on the wild type but the leaf area was smaller in comparison to the mutant.
-Both plants in far red light were unable to grow, as we expected.
- In White Light, the wild type stems were longer than the mutant, but not significantly. Also, the leaf area was larger.

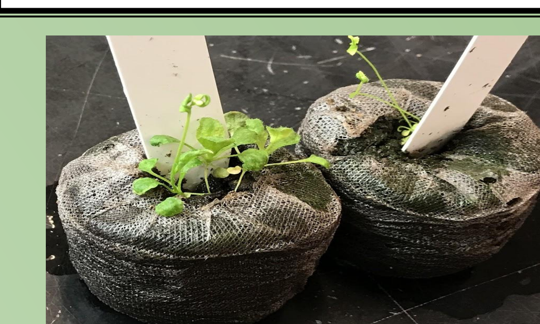

Figure 13: Red Film mutant (left) and wild type (right)

Figure 14: White Light mutant (right) and wild type (left)

CONCLUSIONS

- Our experiment tested the effects different wavelengths of light have on the growth of *Landsberg Erecta* and mutation *phy-5* in Phytochrome B.
- In Far Red Light: both the mutant and wild type were unable to grow as expected, and died.
- In Near Red Light *phy-5* does not etiolate whereas *Landsberg Erecta* does. The p-values is smaller than our chosen significance level, so there is enough evidence at the .05 significance level to conclude that there is a statistically significant difference between the means.
- In white light: the *Landsberg Erecta* grew more, but there is not much difference. The p-value is larger than our chosen significance level, so there is not sufficient evidence to suggest that the means are not the same. However, this doesn't matter as we predicted that there wouldn't be much difference.
- **Design Errors:**

While measuring, we exposed the red light plants to white light temporarily which could have altered our data.

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