



The Effect of Light Intensity and Color on Above and Below Ground Development in *Arabidopsis thaliana*

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Background

Light is one of the essential factors for photosynthesis and plant growth. In addition, light regulates patterning in the root and shoot system. Light signals are recognized at the shoot and then translocate through the phloem to the root for root development. In this experiment, *Arabidopsis thaliana*, Col-g1 (Columbia) was grown under different treatments such as high light, medium light, red light, and blue light. For purpose of this experiment both vegetative and reproductive development were considered.

Hypothesis

The root development in *Arabidopsis thaliana* shows positive responses to high light intensity and color.

Growth Condition

Day temperature: 22 to 23°C

Night temperature: 18°C

Light Intensities: High light (1500 lumen), medium light (800 lumen), low light(450 lumen)

Light Colors: Red light and blue light.

Light time: 16 hrs light, 8 hrs dark

Method

1. Seed sanitized using 95% ethanol and 20% bleach solution.
2. Seed stratified at 4°C for 5 to 7 days.
3. Preparation of Murashigi-Skoog agar with antibiotics in 4-inch test tubes.
4. Seed plantation using sterile micropipette.
5. Root and shoot length in every two days.
6. Harvesting plant and Root and shoot length measurement.

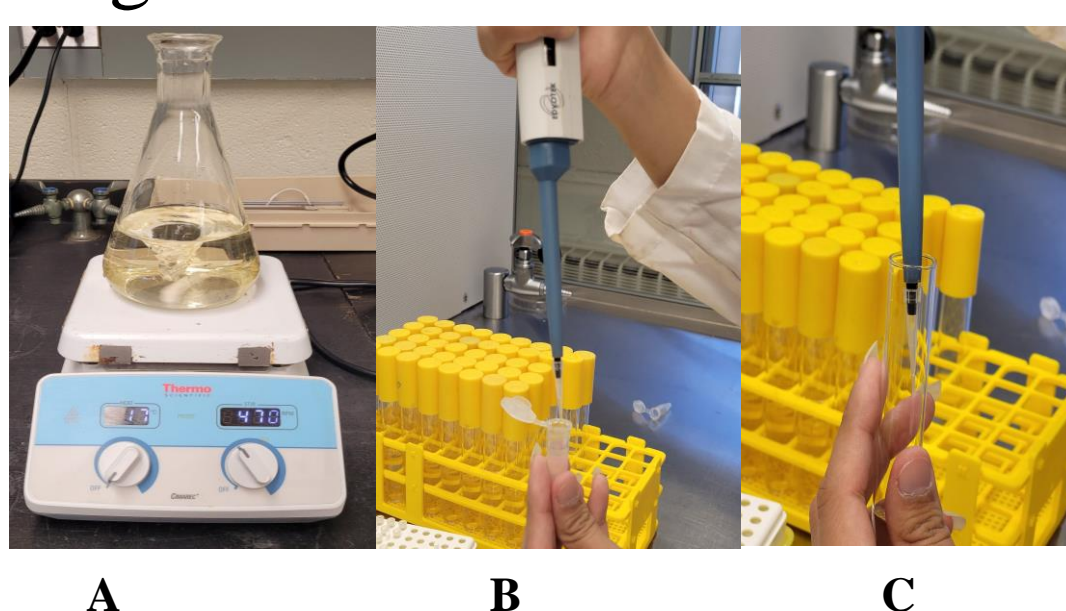


Figure 1: Picture A presents the preparation of the Murashigi-Skoog agar which was then added in the tubes. Picture B presents the sanitization of the seeds. Picture C presents the plantation of the seeds at the Murashigi-Skoog agar tube.

Treatment

Table 1: Total number plants under 5 treatments

High Light	Medium Light	Low Light	Red Light	Blue Light
11 Plants	11 plants	11 plants	11 plants	11 plants

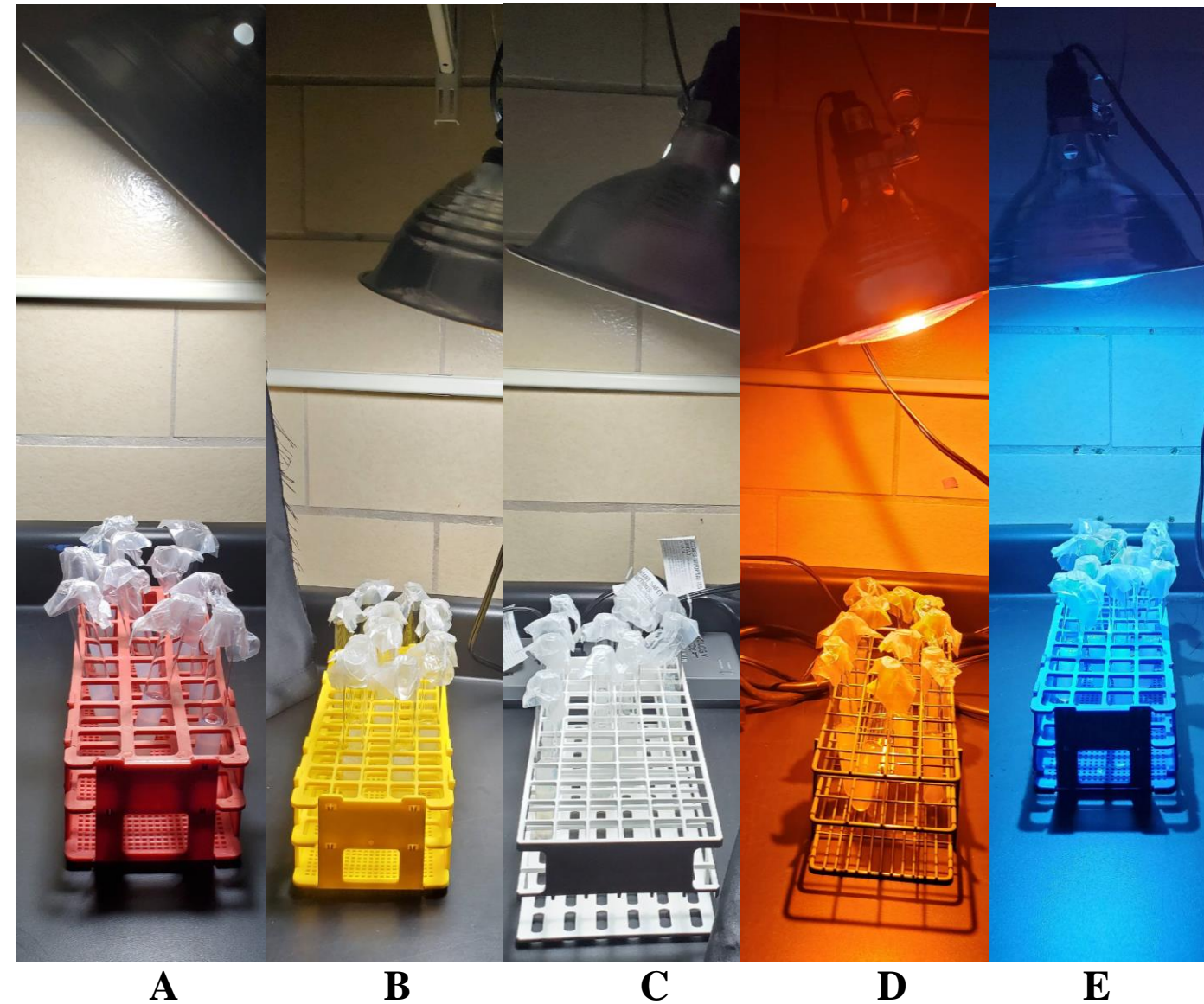


Figure 2: *Arabidopsis thaliana* treated with different light intensities and colors: A) High light Intensity, B) Medium light Intensity, C) Low light Intensity D) Red Light E) Blue Light

Results

Table 2: Percentage growth under each treatment every week.

Time	High Light	Medium Light	Low Light	Red Light	Blue Light
Week 1 (Germination)	18.2 %	27.2 %	45.5 %	54.5 %	45.5 %
Week 2	27.2 %	45.5 %	54.5 %	63.6 %	54.5 %
Week 3	45.5 %	54.5 %	63.6 %	72.7 %	63.6 %
Week 4	54.5 %	63.6 %	81.8 %	81.8 %	81.8 %
Week 5 (Harvesting)	54.5 %	63.6 %	81.8 %	81.8 %	81.8 %

Above Ground Growth

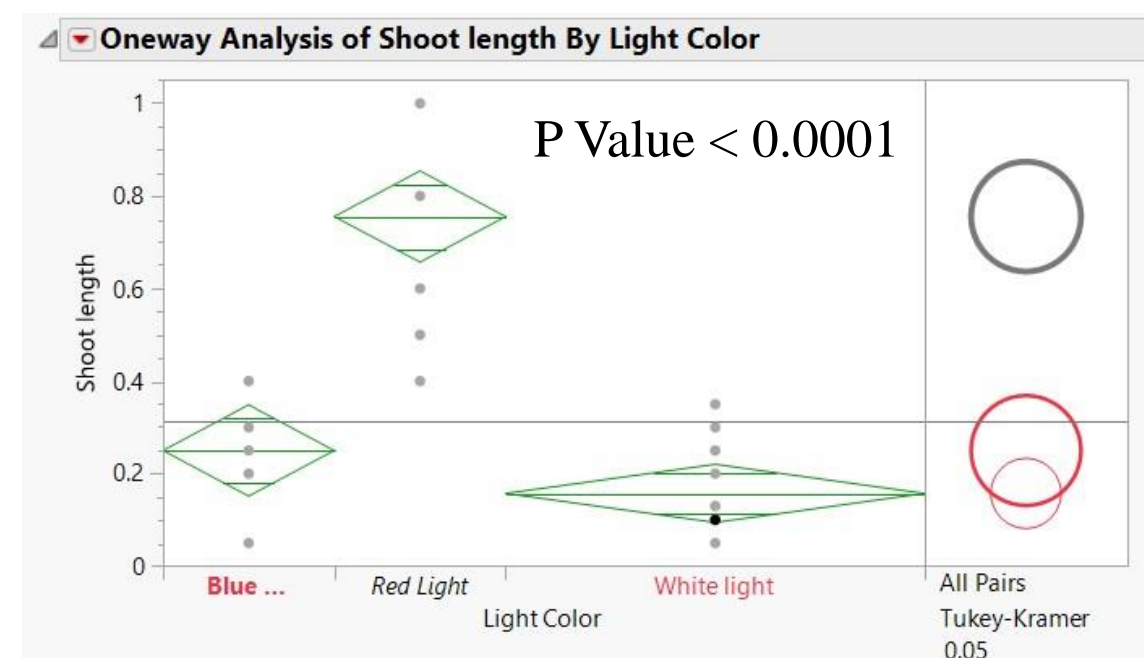


Figure 3: Oneway means ANOVA analysis of shoot length by light color and All pairs Tukey-Kramer 0.05

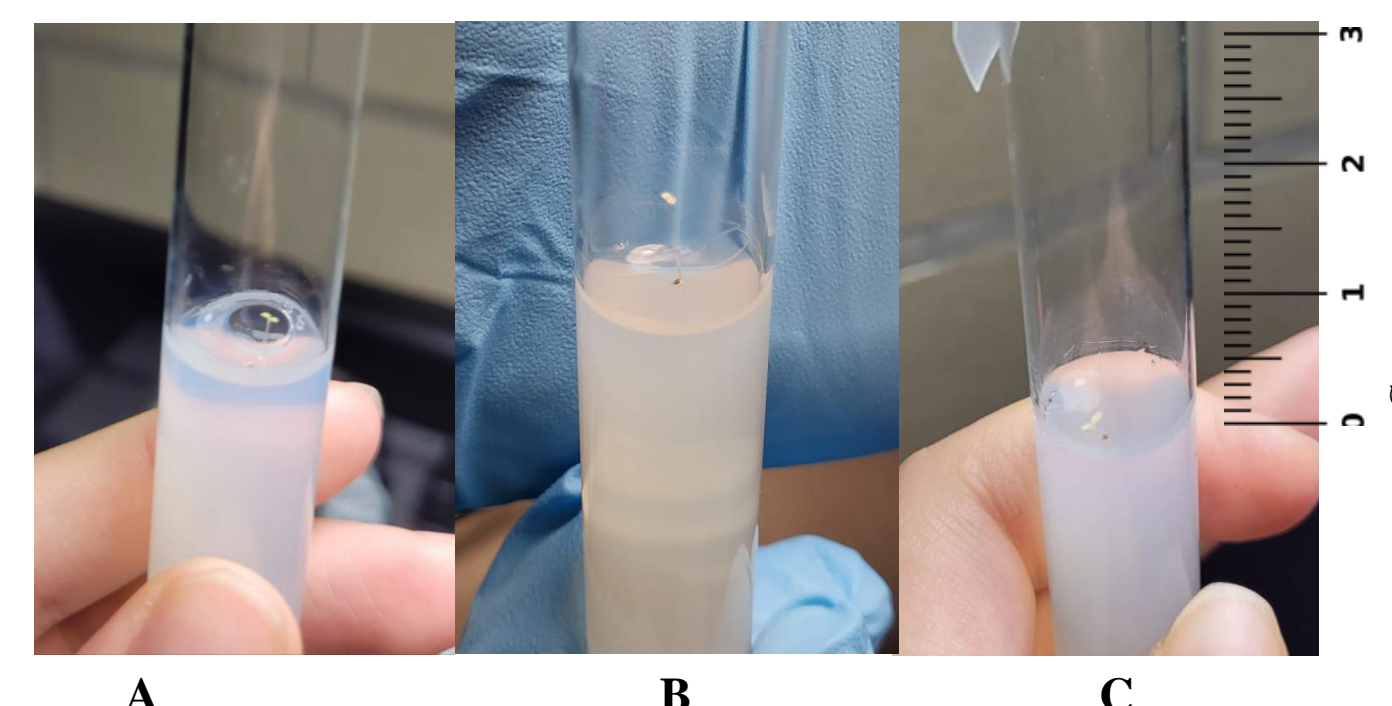


Figure 4: Maximum shoot growth of *A. thaliana* under each light color: A) Blue light, B) Red light and C) White light

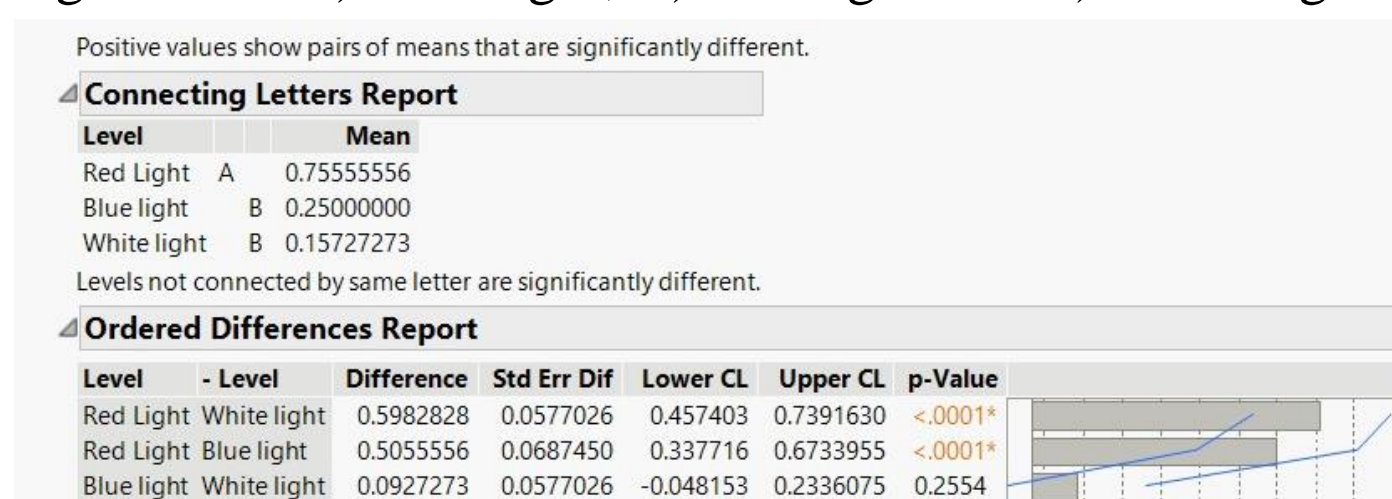


Figure 5: Connection letter Report of each treatment and ordered difference report comparing p value of growth under each light color.

Below Ground Growth

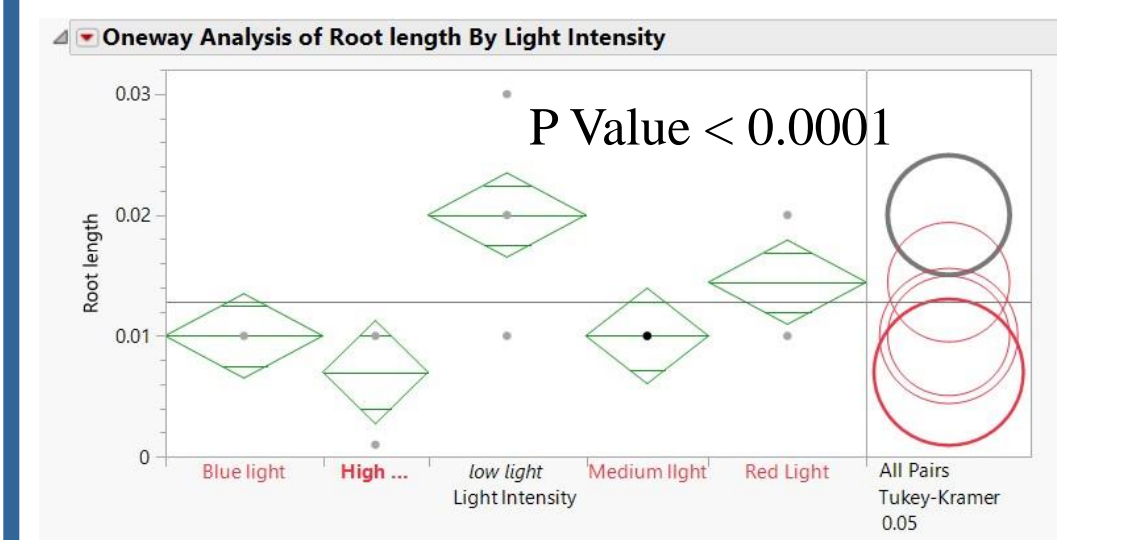


Figure 6: Oneway means ANOVA analysis of root length by all light treatments and All pairs Tukey-Kramer 0.05

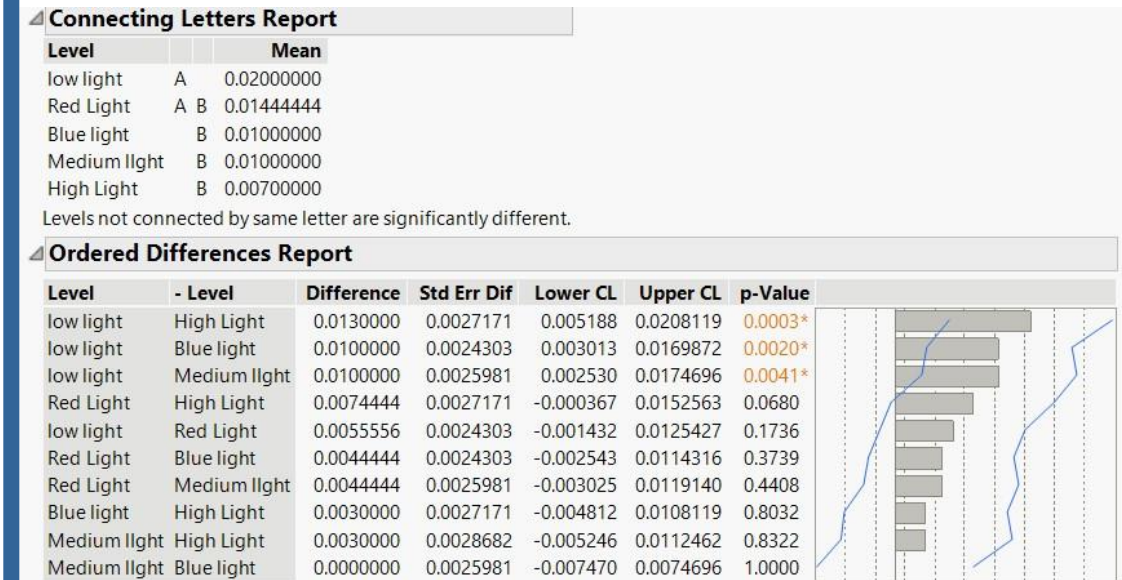


Figure 7: Connection letter Report of each treatment and ordered difference report comparing p value of growth under each light color

Overall plant growth

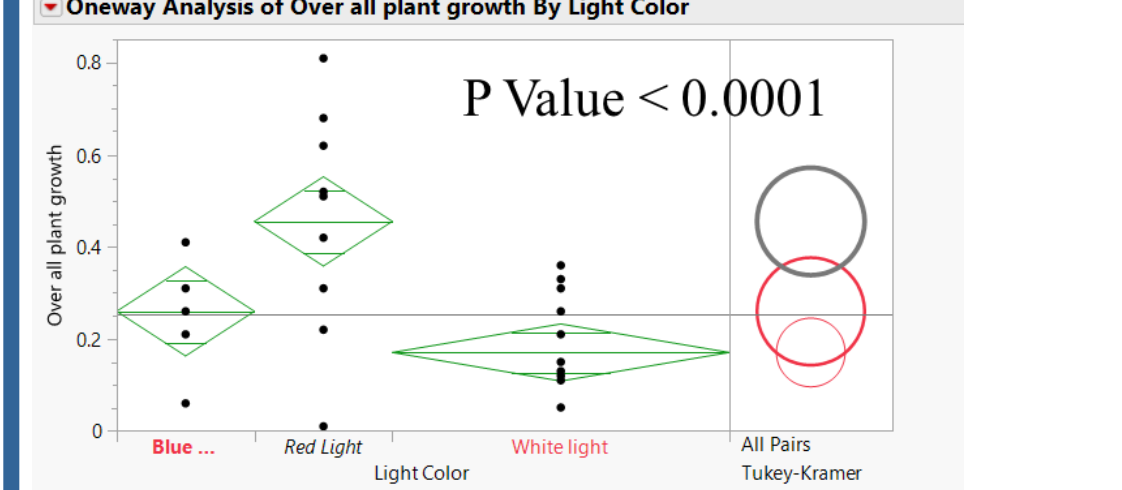


Figure 6: Oneway means ANOVA analysis of overall growth by all light color and All pairs Tukey-Kramer 0.05

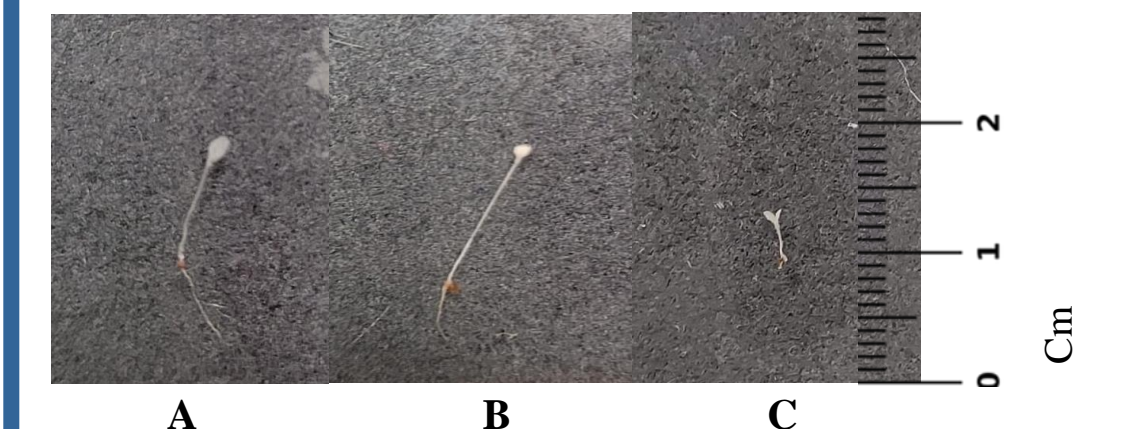


Figure 4: Overall growth of *A. thaliana* under each light color: A) Blue light, B) Red light and C) White light

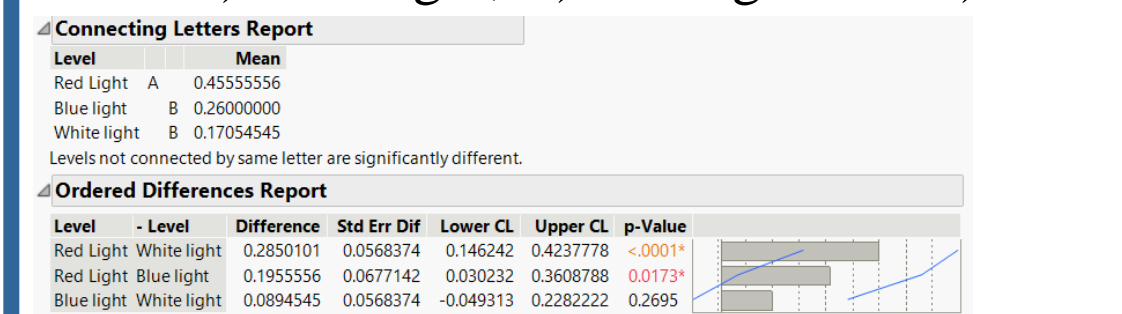


Figure 5: Connection letter Report of each treatment and ordered difference report comparing p value of growth under each light color

Conclusion

1. High light Intensity shows a negative effect on the root and shoot development in *Arabidopsis thaliana*.
2. Low light Intensity shows positive effect on the root and shoot development in *Arabidopsis thaliana*
3. Red light shows the best above and below ground development.

Acknowledgements

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