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The Effects of Light Wavelength and Gravity on *Physarum polycephalum* Growth

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Abstract

Physarum is a slime mold in the genus of mycetozoan and the family of Physaraceae. It is a single cellular, multinuclear organism that is not classified as an animal, plant, or fungi. The purpose of this experiment is to study the effect of different light wavelengths and the influence of gravity on *Physarum* growth patterns. The *Physarum* is grown in a bacteriological agar with distributed oats as its food base. Red, green, blue, red and blue, and no light was studied and expansion was documented. The possible effects of gravity conditions were introduced by a clinostat. The experiments showed that different light and gravity environments had no effect on expansion and growth of the *Physarum* in these conditions. The experimental results were analyzed using a single factor ANOVA test, concluding, all p-values showed statistical indifference between each condition. Therefore, the search for a food source has more influence on *Physarum* growth than different wavelengths of light and clinostat conditions.

Materials and Methods

- 1 culture of *Physarum* was used to start the experiment.
- 150 mm petri dishes were used to maintain the culture.
- 100 mm petri dishes were filled with 2 percent bacteriological agar for a nutritious under bed. 40 plates were used per experiment.
- The slime mold was transferred from the culturing plate to the experimental plates using a micro lab spatula. The slime mold covered a 1cm by 1cm area in the center of the plate.
- Quaker Oats were dispersed on the plate in an X shape. 2 oats were placed in the middle, 4 oats were placed on the sides, and 4 oats were placed between the middle and side oats. (Figure 1)
- A sterilization technique was used to plate the *Physarum* and oats.
- The 40 plates were split into 10 groups. Each light wavelength incubator has a “clinostat” and “stationary” group.
- A line was drawn through the middle of the plate to create a division to compare if *Physarum* grew to the Light or Dark.
- The plates were labeled and put into different light wavelength incubators and either on a clinostat or stationary. (Figure 8)
- The incubators had 3 specific light wavelengths. (Red- 635nm, Green- 525nm, Blue- 460nm) (Figure 4, 5, 6)
- Each group was wrapped in black crepe streamers to prevent reflection inside the incubator. A 1cm by 8cm slit was cut out of the designated light side of the plates. (Figure 7)
- The experiment went on for three days. Each day the stationary groups were taken out of their incubators and photographed. (Figure 2)

- On the third day of the experiment, all plates were photographed and the *Physarum* growth was measured using a sheet with 1.5cm grids. (Figure 3)
- A single factor ANOVA test was used to gather p-values comparing the difference between light and dark growth, the difference between light wavelengths, and the difference between the clinostat and stationary conditions.

Images

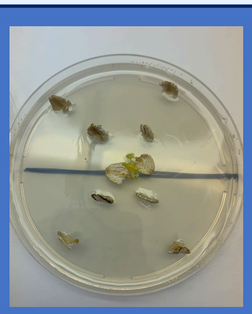

Figure 1: Experimental plate at day 0.

Figure 2: Experimental plate at day 2.

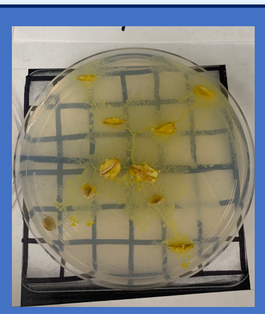

Figure 3: Experimental plate at day 3.

Figure 4: Blue- 460nm Incubator and clinostat.

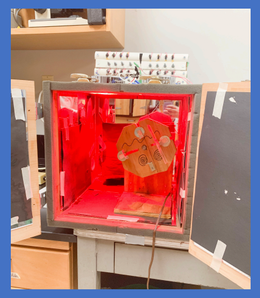

Figure 5: Red- 635nm Incubator and clinostat.

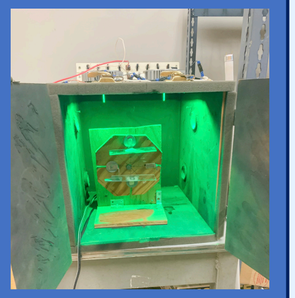

Figure 6: Green- 525nm Incubator and clinostat.

Figure 7: Plates wrapped In crepe streamers with A slit on the side.

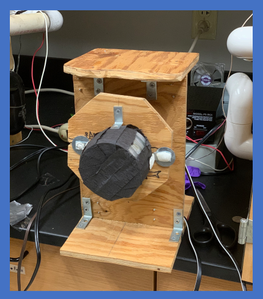

Figure 8: Plates on the clinostat.

Figure 9: *Physarum* in The environment.

Results

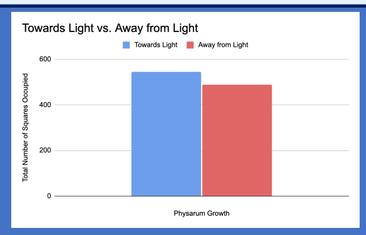

Figure 10: This shows that *Physarum* growth showed no statistical difference when stationary and clinostat growth was compared together. The P-value is 0.2866

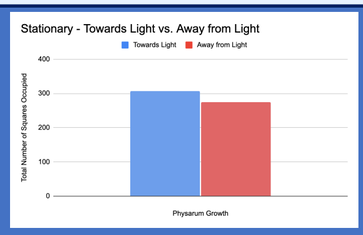

Figure 11: This shows that when comparing the stationary *Physarum* growth, there is no statistical difference. The p-value is 0.4249

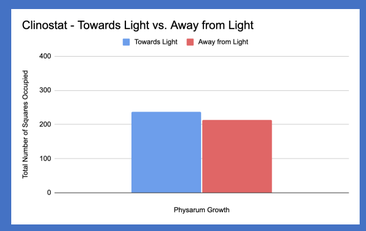

Figure 12 shows no statistical difference in the growth of *Physarum* in different wavelengths of light and in clinostat conditions. The p-value is 0.4828

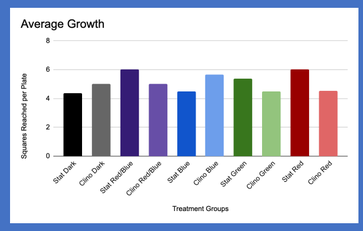

Figure 13 compares the growth of *Physarum* in different wavelengths of light and in clinostat conditions. There is no statistical difference in Physarum growth in any of the conditions.

Discussion

The results show that *Physarum* growth is not affected by different light wavelength or gravity. A single factor Anova test analyzed the the difference between growth in light or dark regions of the plate, clinostat and stationary conditions, and different wavelengths of light. All p-values showed a statistical indifference, indicating that *Physarum* growth is influenced by food source rather then gravity and light wavelength. In past research, it has been found that specific light intensity can effect *Physarum* growth, because the light can be harmful to the slime mold. It can be assumed that the wavelength and intensity tested in this experiment was not harmful to the organism (10µmol). If tested again, the wavelength intensity should be increased, while the food source and area is also increased. This will allow for no variable to stop growth while tested. In conclusion, light wavelength and gravity in this experiment had no affect on the growth of *Physarum*.

Acknowledgements

Dr. J.D. Patterson, Ouachita Baptist University
NASA/ASGC, INBRE