



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

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Project Title Shorter Days: The Effect of the Day/Night Cycle on the Growth of Plants	
<p style="text-align: center;">Abstract</p> <p>Objectives One of the most pervasive and destructive problems in the modern world is the lack of access to fresh, healthy food. Thus, the goal of our project is to find out whether time and intensity of light can be modeled in an artificial setting to accelerate plant growth and produce mature crops faster. Based on the observation that plants can detect when they receive light and usually grow in a day/night cycle of 12 hours of day and 12 hours of night, we postulated that giving plants short, intense light would be more effective than giving them prolonged, weak light.</p> <p>Methods Radishes were grown in an enclosed environment with regulated temperature and light, plus adequate ventilation. We designed two growth setups (ie., two plantings and two harvestings). In the first setup, we measured the effect of changing the duration of the light/dark cycles but keeping the total light received over 28 days equal. In the second experiment, we attempted to speed up growth by increasing the lighting intensity and commensurately decreasing the light/dark cycle to simulate shorter but more intense days. We measured the height of the plants periodically and measured the mass of the plants at the end of the experiments.</p> <p>Results In the first experiment, the 24 hour cycle plants grew significantly better than the 12 hour plants and 8 hour plants in terms of both mass and height, and the 12 hour plants grew better than the 8 hour plants. In the second experiment, the 24 hour cycle plants again did the best. However, when we allowed the experiment to continue so that all 3 tents grew their plants for 28 calendar days, the trend was reversed, with the 8 hour plants doing the best, followed by the 12 hour plants and the 24 hour plants. The more intense light had a significant positive impact on the mass of the plants even though they received shorter light/dark cycles.</p> <p>Conclusions Our results from the first experiment indicate that plant biochemical processes are more efficient over extended periods of time. Our results from the second experiment indicate that it is difficult to speed up plant growth by shortening light/dark cycles and intensifying light. However, we did find that when we allowed all plants to grow for 28 days in experiment two, the plants that received the greatest light intensity did best regardless of cycle time. This leads us to the conclusion that light intensity is an even greater determinant of plant growth than light cycle time.</p>	
Summary Statement Our project was conducted to study the effects of both intensity and duration of light on plant growth.	
Help Received Our parents helped purchase some materials.	