



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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| Name(s) Ella Giguere | Project Number 38093 |
| Project Title How Does Water Availability Affect Plant Health? | |
| Objectives/Goals The goal of this project was to understand how changes in climate affect plant growth and health. Climate change influences the water cycle and water availability to grow plants. Water is an essential ingredient required for plant growth and development. Changes in water availability due to drought or prolonged rainfall has resulted in poor growth of tomato plants in my garden. It is unclear if water availability or biotic stress (exposure to pathogens) or both are the critical factors affecting the health of my tomato plants each season. This project used a controlled environment (greenhouse) to examine the impact of water and pathogens on plant health. Two questions were asked: 1) What are the optimal water conditions to grow tomato plants in a greenhouse? 2) How does water availability impact the susceptibility of tomato leaves to a common bacterial pathogen, <i>Xanthomonas euvesicatoria</i> ? My hypothesis was: If tomato plants are grown in a saturated water environment, then they will grow the largest, but be more susceptible to bacterial infection. Abstract The goal of this project was to understand how changes in climate affect plant growth and health. Climate change influences the water cycle and water availability to grow plants. Water is an essential ingredient required for plant growth and development. Changes in water availability due to drought or prolonged rainfall has resulted in poor growth of tomato plants in my garden. It is unclear if water availability or biotic stress (exposure to pathogens) or both are the critical factors affecting the health of my tomato plants each season. This project used a controlled environment (greenhouse) to examine the impact of water and pathogens on plant health. Two questions were asked: 1) What are the optimal water conditions to grow tomato plants in a greenhouse? 2) How does water availability impact the susceptibility of tomato leaves to a common bacterial pathogen, <i>Xanthomonas euvesicatoria</i> ? My hypothesis was: If tomato plants are grown in a saturated water environment, then they will grow the largest, but be more susceptible to bacterial infection. Methods/Materials To test this, tomato plants were grown in a greenhouse from seed in soil pots using three different watering conditions (dry, moist, and saturated). After six weeks, leaves were sprayed with a bacterial suspension and then leaf symptoms and bacterial titer were measured for ten days. Results Plants grown in saturated water conditions grew the tallest and had the largest leaves. After ten days of infection, two of the leaves from plants grown in saturated water conditions harbored high titers of bacteria; however, these data were not statistically significant when accounting for all leaves tested. Notably, leaf disease symptoms did not correlate with the number of bacteria in the leaves. Conclusions/Discussion These data indicate that tomato plants require a continuous supply of water under controlled temperature conditions for maximal plant growth. They also suggest that leaf symptom development depends on water availability and not bacterial titer, which was unexpected. Future experiments will investigate the plant factors that cause leaf symptoms and how water may influence them. | |
| Summary Statement I studied how water and bacterial infection affect tomato plant growth and development in a greenhouse environment. | |
| Help Received I designed and performed the experiments by myself. I received help for the bacterial growth assay from Dr. Jung-Gun Kim, my project mentor. He also reviewed my data calculations and discussed my findings. The project was done in Dr. Mudgett's laboratory in the Biology Department at Stanford University. | |