



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Olivia L. Woodford-Berry	Project Number S1815				
Project Title A Novel Approach to Improving Drought Tolerance: The Effects of Biochar on Crop Yield					
<table border="1"><thead><tr><th>Objectives/Goals</th><th>Abstract</th></tr></thead><tbody><tr><td><p>The objective is to determine the effects of sugarcane derived biochar on the drought tolerance of <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> variation <i>longifolia</i>.</p><p>Methods/Materials</p><p>Biochar was produced by placing small pieces of sugarcane in a sealed tin for several hours in open flame. Biochar was added to top soil in various doses (15% or 50% by volume of soil) to the <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> seeds grown under drought conditions or sufficient watering conditions. Drought conditions were quantified through preliminary studies testing the soil's water carrying capacity. Drought conditions and sufficient water were defined as 20% (29mL) and 60% (87mL) of the water carrying capacity. Controls without biochar were also studied. Growth over time, survival rate, germination time, and maximum survival time without water were measured.</p><p>Results</p><p>Studies of <i>Lactuca sativa</i> show that a soil composition of 15% biochar has the best effects on drought tolerance. Both biochar groups show greater growth than groups without biochar. On average, plants grown in biochar had a higher survival rate, regardless of watering. The strongest statistical results related to germination, as plants grown in a 50% biochar soil mixture germinate more than twice as fast as plants grown in top soil.</p><p>In the case of <i>Lycopersicon esculentum</i>, plants grown in 15% biochar composition show the greatest increase in growth compared to plants grown without biochar under drought conditions and plants grown without biochar with sufficient water. Plants grown in a 15% biochar mixture germinate twice as fast as plants grown in top soil. Overall, both plants show higher survival rates when drought conditions were mitigated with biochar. In addition, Plants grown in biochar can last without water more than three times longer than controls. Furthermore, while fungus appeared in the control groups, no fungus appeared in groups with biochar.</p><p>Conclusions/Discussion</p><p>The results of this study suggest that the addition of biochar to soil improves the drought tolerance of <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> variation <i>longifolia</i>.</p></td><td></td></tr></tbody></table>		Objectives/Goals	Abstract	<p>The objective is to determine the effects of sugarcane derived biochar on the drought tolerance of <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> variation <i>longifolia</i>.</p> <p>Methods/Materials</p> <p>Biochar was produced by placing small pieces of sugarcane in a sealed tin for several hours in open flame. Biochar was added to top soil in various doses (15% or 50% by volume of soil) to the <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> seeds grown under drought conditions or sufficient watering conditions. Drought conditions were quantified through preliminary studies testing the soil's water carrying capacity. Drought conditions and sufficient water were defined as 20% (29mL) and 60% (87mL) of the water carrying capacity. Controls without biochar were also studied. Growth over time, survival rate, germination time, and maximum survival time without water were measured.</p> <p>Results</p> <p>Studies of <i>Lactuca sativa</i> show that a soil composition of 15% biochar has the best effects on drought tolerance. Both biochar groups show greater growth than groups without biochar. On average, plants grown in biochar had a higher survival rate, regardless of watering. The strongest statistical results related to germination, as plants grown in a 50% biochar soil mixture germinate more than twice as fast as plants grown in top soil.</p> <p>In the case of <i>Lycopersicon esculentum</i>, plants grown in 15% biochar composition show the greatest increase in growth compared to plants grown without biochar under drought conditions and plants grown without biochar with sufficient water. Plants grown in a 15% biochar mixture germinate twice as fast as plants grown in top soil. Overall, both plants show higher survival rates when drought conditions were mitigated with biochar. In addition, Plants grown in biochar can last without water more than three times longer than controls. Furthermore, while fungus appeared in the control groups, no fungus appeared in groups with biochar.</p> <p>Conclusions/Discussion</p> <p>The results of this study suggest that the addition of biochar to soil improves the drought tolerance of <i>Lycopersicon esculentum</i> and <i>Lactuca sativa</i> variation <i>longifolia</i>.</p>	
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Summary Statement This experiment tests the use of biochar as a potential tool to mitigate drought conditions and improve the drought tolerance of plants.					
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