



**CALIFORNIA STATE SCIENCE FAIR  
2016 PROJECT SUMMARY**

<b>Name(s)</b> <b>Titash Biswas</b>	<b>Project Number</b> <b>S1801</b>
<b>Project Title</b> <b>Drowning the California Drought: A Novel Approach of Combining Biochar and Gypsum to Improve Crop Yield</b>	
<b>Abstract</b> <b>Objectives/Goals</b> California undergoes cycles of severe drought followed by El Niño for several years. The objective of this study was to determine which soil amendments, or combinations of biochar and gypsum, would improve the water retention capacity of average soil and efficiently combat the effects of droughts and excess water on <i>Lycopersicon esculentum</i> (tomato) and <i>Allium cepa</i> (onion). <b>Methods/Materials</b> Drought, normal, and El Niño conditions, defined as 10%, 50%, and 100% respectively, were quantified from the field capacity of average potting soil. The design of experiment utilized six soil compositions, average potting soil (control), 10% biochar, 30% biochar, 10% biochar and 5% gypsum, 30% biochar and 5% gypsum, and 5% gypsum, by weight, and three water levels for two replications of <i>Lycopersicon esculentum</i> and <i>Allium cepa</i> . Parameters such as plant height for <i>Lycopersicon esculentum</i> and root length and biomass for <i>Allium cepa</i> were measured over a three week period, after a seven day equilibrium period. <b>Results</b> Plant growth measurements of <i>Lycopersicon esculentum</i> showed that a soil composition of 10% biochar and 5% gypsum resulted in the highest growth rate during drought conditions. <i>Lycopersicon esculentum</i> 's growth was not significantly affected by 30% biochar. During drought conditions, <i>Allium cepa</i> 's growth rate increased with 30% biochar and 5% gypsum. Data displayed that the addition of 5% gypsum increased water retention and growth rates for both plants during El Niño conditions. <b>Conclusions/Discussion</b> This project's results suggest a combination of 10% biochar and 5% gypsum to be most beneficial for the growth rate of <i>Lycopersicon esculentum</i> and 30% biochar and 5% gypsum for <i>Allium cepa</i> . An integration of biochar and gypsum is the optimum solution to simultaneously combat the California drought and attempt to utilize excess water during El Niño years.	
<b>Summary Statement</b> I found a combination of biochar and gypsum with average soil to be the optimum soil amendment to increase soil's water retention and crop yield during drought conditions.	
<b>Help Received</b> Mr. Jonathan Ng assisted me with the statistical analysis of the data acquired from my project.	