



# CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

<b>Name(s)</b> <b>Danielle M. Cadena</b>	<b>Project Number</b>  <b>35014</b>
<b>Project Title</b> <b>What about the Little Guys? A Study on the Effects of Acid Rain on Agricultural Soil Bacteria</b>	
<b>Objectives/Goals</b> My objective was to see how acid rain will affect soil bacterial communities in agricultural soil.	
<b>Methods/Materials</b> I cut two plastic 250 mL graduated cylinders down to 7 ½ in. to create my soil containers. I got my soil samples by using the soil core sampling method. I used a lead pipe and hammered it into the farm's soil. Then I pushed the soil bottom to top into the soil container using a wood dowel. I created the acid rain by diluting 1.0 M H <sub>2</sub> SO <sub>4</sub> with distilled water until I got a pH of 4.3. I simulated rain by transferring 15 mL of acid rain into the soil containers using a pipette. I swabbed for bacterial populations before the rain, 1 hour after the rain, 4 hours after the rain, 24 hours after the rain, and 48 hours after the rain. After the plates had been in the incubator for 24 hours, I counted the colonies and number of species on the plate.	
<b>Results</b> In the Mahoney Blueberry Farm soil sample, the largest decrease was 31%. In the DB Specialty Farms soil sample, the largest decrease was 48%. In Mahoney Blueberry Farm, the chi-square value for 1 hour after the rain was 0.08703665 (99.91% confidence); for 4 hours after the rain it was 0.00115743 (99.99% confidence); for 24 hours after the rain it was 0.003514491 (99.99% confidence); for 48 hours after the rain it was 0.03101345 (99.97% confidence). In DB Specialty Farms, the chi-square value for 1 hour after the rain was 0.00083156 (99.99% confidence); for 4 hours after the rain it was 3.06323x10 <sup>-10</sup> (99.99% confidence); for 24 hours after the rain it was 2.575x10 <sup>-6</sup> (99.99% confidence); for 48 hours after the rain it was 4.54373x10 <sup>-5</sup> (99.99% confidence). A bacteria, I believe to be Azobacter, was found to be in both farms. In Mahoney Blueberry Farm, its population decreased the most by 95%. In DB Specialty Farms, it decreased the most by 65%.	
<b>Conclusions/Discussion</b> The acid rain depleted populations and disrupted species diversity levels in the soil up to 24 hours after the rain. Population levels returned 48 hours after the rain because most of the acid had reached the bottom of the soil. Azobacter, a nitrifying bacteria, showed very little resistance to the acid rain. Nitrifying bacteria provide usable nitrogen for plants which they use as nutrients or fertilizers and without them this process could not occur. The effects acid rain could have on just the soil community could be reflected in the plants themselves through their growth and health.	
<b>Summary Statement</b> The Effects of Acid Rain on Agricultural Soil Bacteria	
<b>Help Received</b> Participant in Summer Science Institute at Allan Hancock College	