



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> Vincent A. Chen	<b>Project Number</b> <b>J1999</b>
<b>Project Title</b> <b>Effects of Priming with Plant Hormones and Antioxidants on Salt Tolerance in Alfalfa Seeds (<i>Medicago sativa</i>)</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> It is known that priming seeds with water can enhance the tolerance to saline growth conditions compared to seeds that are not primed. My objective was to examine the effects of priming with salicylic acid and ascorbic acid on alfalfa seeds grown in saline conditions to evaluate whether or not these agents could increase salt tolerance above that induced with water-priming alone. My Null Hypothesis was: Priming with salicylic acid and ascorbic acid will not affect germination and growth of alfalfa seeds any different than that of priming with water.</p> <p><b>Methods/Materials</b> Primed and unprimed alfalfa seeds were germinated and grown in water and various concentrations of NaCl. A 4 x 2 experimental design was used, consisting of 4 seed treatments (types) and 2 experimental conditions: unprimed seeds and those primed with water, 0.75 mM sodium ascorbate (also ascorbic acid, and 1 mM salicylic acid, and, growth in water or 140-150 mM NaCl. After drying back to their original weight, seeds were germinated and grown in water or NaCl for 60-90 hours. Measurements were made of the percent germination, root length, and opening of the dicotyledon leaves.</p> <p><b>Results</b> Results indicate that, for the parameters measured (% germination, root length (mm), and % opening of the dicotyledon leaves), all primed seeds responded better than unprimed seeds. More importantly, seeds primed with Na-ascorbate or Salicylic acid exhibited a greater response than water-primed seeds. These results fail to support the Null Hypothesis, which must therefore be rejected in favor of an Alternative Hypothesis: Priming with Na-Ascorbate and Salicylic acid permits greater germination and growth in saline conditions (salt tolerance) than water-primed seeds.</p> <p><b>Conclusions/Discussion</b> Salt tolerance of alfalfa seeds can be enhanced by priming with Na-Ascorbate or Salicylic acid to a greater extent than priming with water. These results are consistent with literature reports. Currently about 22% of world's farmland soil too salty to support crop growth. With soil salinity expected to increase over the next three decades, and the population of the world expected to increase by 2 billion people in the same time-period, priming the seeds of important foraging crops, such as alfalfa, seems to be an inexpensive and effective way to increase crop yield and stave off a potential world hunger crisis.</p>	
<b>Summary Statement</b> Priming with sodium ascorbate and salicylic acid enhances salt tolerance of alfalfa seeds over that of water priming alone.	
<b>Help Received</b> Grandfather helped photography, some calculations, plotting, and discussions.	