



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> <b>Ray C. Huang</b>	<b>Project Number</b> <b>S1903</b>
<b>Project Title</b> <b>The Recipe for More Food: Increasing the Geographic Range of C3 Plants</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective is to see if an increase of pH in the root environment of C(3) plants would induce stomatal opening.</p> <p><b>Methods/Materials</b> With 14 C(3) plants in each group, (<i>Tradescantia pallida</i>) the EXPERIMENTAL and CONTROL were all placed under control lighting and temperature in an environmental chamber (2 60-watt light bulbs at 28 degrees Celsius/82.4 degrees Fahrenheit). The independent variable was the pH of each group, with CONTROL under a distilled pH 7 water solution, and EXPERIMENTAL under a distilled pH 10 water solution, all via root water exposure. 100 stoma were counted in each plant, and these counts were placed on a list based on how many open/closed stoma there were out of these 100 stoma.</p> <p><b>Results</b> There was an average of 80 open stoma and 20 closed stoma in the EXPERIMENTAL and average of 30 open stoma and 70 closed stoma in the CONTROL. In order to reject the null hypothesis, an independent 2-tailed t-test was conducted. Calculation showed that <math>t=7.1655</math>. With a degree of freedom of 13, a t-distribution chart showed that (with a conventional confidence level of 5%) the critical t-value was 2.160. These statistics rejected the null hypothesis because t was greater than the critical t-value.</p> <p><b>Conclusions/Discussion</b> With an ever-increasing human population, there must be enough food to feed it. The most widespread food consumed globally is rice, which provides more than one fifth of calories consumed by humans. One important factor that is affecting the amount of rice produced is the geographic range of this crop. Rice is a C(3) plant that must close its stoma in a high temperature environment to conserve water. This stomatal closure initiates photorespiration which lowers glucose production and kills the plant. The data suggested in this experiment showed that an artificial high pH stimulus could override the water-conserving stomatal closure of C(3) plants, and thus prevent photorespiration. These results could be the basis for the expanded growth of food C(3) plants such as rice.</p>	
<b>Summary Statement</b> Increasing the geographic range of C3 food plants by inducing stomatal opening to prevent photorespiration.	
<b>Help Received</b> Parents helped make board; Teacher provided lab equipment at Clovis West High School	