



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> Xiafei Zhang	<b>Project Number</b> <b>J1631</b>
<b>Project Title</b> <b>The Effects of Temperature and pH on the Germination and Early Growth of Mung Beans</b>	
<b>Objectives/Goals</b> My objective was to study how temperature and pH affect the germination and early growth of Mung Beans.	
<b>Abstract</b> <b>Methods/Materials</b> My experiment was done in 2 groups, temperature and pH. For the temperature group, I did conditions at -8 <sup>o</sup> C, 5 <sup>o</sup> C, 10 <sup>o</sup> C, 20 <sup>o</sup> C, 30 <sup>o</sup> C, 40 <sup>o</sup> C. I controlled the pH value of the water (pH6.8), the air, and the moisture. I measured the number of beans germinated and the length of the sprout of the Mung Beans across time. For the pH group, I did conditions at pH 4.2, pH5.4, pH6.8, pH8.2, and pH9.1. I controlled the temperature (at 20 <sup>o</sup> C), the air, and the moisture. I measured the number of beans germinated and the length of the sprout of the Mung Beans across time. I observed the germination and early growth mung beans 6 to 7 times in a maximum of 72hrs. I had 10 trials for each condition, 50 beans for each trial, and 9 conditions for the project. I used the following materials: Mung Beans, Pincers, Sponges, Water, Thermometer, Metric Ruler, See-Through Glass Vessel, Water bath, Sodium Phosphate Monobasic, Sodium Phosphate Dibasic, Magnetic Stirrer, Stirring Bar, pH paper, Gloves.	
<b>Results</b> For the temperature group, beans at 20 <sup>o</sup> C, 30 <sup>o</sup> C, 40 <sup>o</sup> C germinated but beans at -8 <sup>o</sup> C, 5 <sup>o</sup> C, 10 <sup>o</sup> C did not. Beans at 40 <sup>o</sup> C germinated and grew better than beans at 30 <sup>o</sup> C, beans at 30 <sup>o</sup> C germinated and grew better than beans at 20 <sup>o</sup> C. For the pH group, beans at pH5.4, pH6.8, and pH8.2 germinated but beans at pH9.1 and pH4.2 did not. Beans at pH 6.8 germinated and grew better than beans at pH5.4. Beans at pH5.4 germinated and grew better than beans at pH8.2.	
<b>Conclusions/Discussion</b> Within the temperature range that mung beans can germinate and grow, the higher the temperature, the better the mung beans will germinate and grow. Neutral pH is the best pH environment for the germination and early growth of Mung Beans. Basic and acidic pH environment can slow down or even stop the germination and early growth of Mung Beans.	
<b>Summary Statement</b> Temperature and pH significantly affect the germination and early growth of Mung Beans.	
<b>Help Received</b> Dad helped me do part of the graphs, and look over grammar mistakes.	