



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Sophia A. Harrison	Project Number J1910
Project Title The Effect of Temperature on the Growth of Red Radishes with Symbiotic Endomycorrhizae	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To find the optimal temperature range for endomycorrhizal radish root colonization and the effect of endomycorrhizae and temperature on production of radish biomass.</p> <p>Methods/Materials I placed six identical storage bins with sterilized soil in three different temperature zones: 7C, 18C, 26C. Each temperature zone had one bin with 120 grams of endomycorrhizal fungi and one without. I placed four 50 watt growing lamps in the 7C and 18C zones mimicking outdoor photo period. The 26C zone was covered with plastic wrap and put in the sun to produce enough heat. Each bin was planted with red radish seeds. After 4 weeks I extracted the radishes and measured fresh weight. I measured mycorrhizal colonization of the roots using .05% acidic stain. I counted the total horizontal and vertical intersections of the roots with a graph paper grid. Under a microscope I counted intersections where the root was mycorrhizal (stained pink). The sum of the mycorrhizal intersections divided by the sum of total intersections equals the percentage of colonization. Lastly I dried all radish roots and measured dry weight.</p> <p>Results Measured in grams FW: Fresh Weight DW: Dry Weight. 7C with fungi FW: 13 DW: 3 75% colonization. 7C without FW:4 DW: 1. 18C with fungi FW:20 DW:4 40% colonization. 18C without FW: 16 DW: 3. 26C with fungi FW:3 DW:0.5 21% colonization. 26C without FW: 2 DW: 0.2</p> <p>Conclusions/Discussion Radishes grown with endomycorrhizae in all climates produced more biomass than the non-mycorrhizal radishes. Mycorrhizae improves uptake of essential plant nutrients and water. At 18C, radishes with and without fungi had their maximum growth. At this temperature both bins had the highest biomass because 18C is the idea temperature for growing radishes. The mycorrhizal colonization of radishes was highest at the lowest temperature 7C. Endomycorrhizae lives in soil at the same depth as radish roots. The average temperature at that depth is about 5C which is close to the temperature where I found mycorrhizal colonization to be highest. By natural selection the mycorrhizal enzyme system evolved to function best at 5C.</p>	
Summary Statement Finding the temperature at which endomycorrhizae and radishes produce the most biomass can improve agriculture in poor soil and drought conditions as well as show a producer which temperature yields the most crop with the fungi.	
Help Received Mrs. Levine, my science teacher, helped me with experimental design and helped answer many of my questions. My parents bought materials and helped type.	