



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

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Project Title What Affects Transpiration the Most: Light or Temperature?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective was to determine which environmental factor most affects the water loss from a plant due to transpiration- Is it light or is it temperature?</p> <p>From summer to winter the peak temperature in Santa Clara falls by 14°C. Many plants respond to this by drastic adaptations-loss of chlorophyll and shedding of leaves in fall. Non-deciduous plants go into hibernation. Interestingly, in summer, average day-night temperature change is ~14°C. In response plants do not show visible changes diurnally. We wanted to test if plants instead respond internally by controlling the transpiration water loss. These questions may help us understand the role plants play in the earth's water cycle and the role of native plants in ecology.</p> <p>Methods/Materials We experimented on two plants from our backyard, Aster and Grapefruit. Using plant cuttings in a water beaker, we first monitored the amount of water loss to transpiration when the plants are exposed to light and then to darkness, keeping the temperature constant. Later we monitored the transpiration in darkness, at two temperatures, hot (27°C) and cold (16°C). We followed this up with microscopy of the leaf stomata to probe for internal differences.</p> <p>Results Transpiration measurements show that Aster responds to temperature changes more than Grapefruit and has a lower water loss at high temperatures. Both plants transpire more in response to light changes than to temperature changes. This disproved our hypothesis. Both showed significant transpiration even in darkness. Microscopy results of the leaves showed that both the plants had different sizes and density of stomata, aster's being smaller. By serendipity, we could observe the stoma open in about 8 min in time lapse photos.</p> <p>Conclusions/Discussion Aster responded to temperature changes more than grapefruit, which is probably why it is drought tolerant. The observed difference in stomata size, shape and density are the likely reason for their varying response to environmental stimuli. We found that plants release a lot of water by transpiration, even at night. This shows the importance of planting drought tolerant native plants in arid places and also the importance of rainforests in maintaining the water cycle.</p>	
Summary Statement Effect of changes in temperature and light on transpiration in plants and its implication for the environment.	
Help Received My mother taught me to use a microscope and helped glue the papers in the board. My father helped plot the graph. Ms. Henderson gave advice on the presentation.	