



# CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

<b>Name(s)</b> <b>Alex Chen; Samir Malhotra</b>	<b>Project Number</b> <b>S2004</b>
<b>Project Title</b> <b>Investigating the Morphological, Physiological, and Genetic Variability in Mustard Family</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Our objective was to learn if different members of the brassica (mustard) family are different from each other in their morphology, physiology, growth, and genomics. This group of plants interested us due to their anti-cancer and anti-microbial properties.</p> <p><b>Methods/Materials</b> Seeds from cabbage, broccoli, turnip, mustard, and cauliflower were obtained and germinated under sterile conditions. Our control group was germinated at room temperature and the treatment groups were germinated at 4°C, room temperature, 30°C, and 45°C. The germinated seeds were used for obtaining the rate of germination, DNA extraction, carbon dioxide production, microscopy, Polymerase Chain Reaction (PCR), and gel electrophoresis. We also studied the effect of cold treatment on the rate of seed germination.</p> <p><b>Results</b> Our data shows that all seeds germinated much better (70-100%) at room temperature as compared to other temperatures (0-90%). At room temperature, the rate of germination was the highest (100%) in cabbage followed by mustard (90%). Seeds failed to germinate at extreme low (0%) or high temperatures (10%). Seeds for all plants germinated much better when given a cold treatment before transferring to room temperature for germination (10% higher). Rate of carbon dioxide production was significantly higher in cabbage seeds as compared to other types. When we ran the gels using genomic DNA, we obtained smears due to overlapping fragments and nuclease activity. In order to eliminate smears, we used RAPD primers and performed a PCR on the genomic DNA. The restriction digests on the PCR products of their genomic DNA showed many clear bands in DNA obtained from different plants.</p> <p><b>Conclusions/Discussion</b> All seeds germinated much better at room temperature as compared to other temperatures. At room temperature, the rate of germination was the highest in cabbage followed by mustard. Seeds failed to germinate at extreme low or high temperatures. A cold treatment increased the rate of seed germination in all types. Rate of carbon dioxide production was much higher in cabbage seeds as compared to other types which correlated with the higher germination rate in this plant. The restriction digests on the PCR products of their genomic DNA showed that there were some differences in the banding patterns between these plants.</p>	
<b>Summary Statement</b> In this project investigates the morphological, physiological, and genetic variability in the Brassica family.	
<b>Help Received</b> Used lab equipment at Thousand Oaks High School	