



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> <b>Mikael H. Matossian</b>	<b>Project Number</b> <b>J0918</b>
<b>Project Title</b> <b>The Effect of Carbon Dioxide and Ozone Enrichment on the Growth Behavior of Bush Bean Plants</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Carbon dioxide and ozone are two pollutant compounds found in our atmosphere. Carbon dioxide is part of the photosynthesis process and can be beneficial to plant growth. However, ozone is a strong oxidizing compound that can be non beneficial to plant growth. The objective of my project is to use plant height and physical appearance to quantify the combined effects of enriched levels of carbon dioxide and ozone on the growth behavior of bush bean plants.</p> <p><b>Methods/Materials</b> Bush bean plants were grown in six plastic containers exposed to the same temperature and sunlight. Plants grown in three of the six containers (the controls) were exposed to enriched levels of carbon dioxide alone (300 to 2000 ppm). Plants grown in the remaining three plastic containers were exposed to combined, enriched levels of ozone (20 to 120 ppb) and carbon dioxide (300 to 2000 ppm). Carbon dioxide was produced by the natural decomposition of organic matter in the plant soil and ozone was produced using a small, commercially available ozone generator. Carbon dioxide levels were measured using color gas detection tubes and ozone levels were measured using color monitor badges. Plant height and physical appearance were measured daily over a period of 22 days to quantify the effects of enriched carbon dioxide and ozone on growth behavior.</p> <p><b>Results</b> Enriched carbon dioxide exposure alone (the controls), resulted in a 20% increase in plant height and a healthy physical appearance. In contrast to this, enriched ozone exposure, combined with enriched carbon dioxide exposure, reduced plant height by 60%, caused spotting of leaves, and eventual physical damage to the exposed plants.</p> <p><b>Conclusions/Discussion</b> My results indicate that for the test conditions of my experiment, ozone enrichment levels of 20 to 120 ppb is enough to negate all the beneficial effects on plant growth due to carbon dioxide enrichment levels of 300 to 2000 ppm, alone. The data suggest that increased ozone pollution in the atmosphere should be monitored carefully by scientists.</p>	
<b>Summary Statement</b> Ozone exposure of bush bean plants negates all the beneficial effects on plant growth due to carbon dioxide exposure alone.	
<b>Help Received</b> Father helped with experimental setup; Professor Antonio Machado (California State University at Northridge) advised the test matrix and methodology; Dr. Sherwood Idso (U.S. Water Conservation Lab, Phoenix, Arizona) suggested carbon dioxide production technique.	