



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> <b>Derk E. Bramer</b>	<b>Project Number</b> <b>J1605</b>
<b>Project Title</b> <b>Orange A-peel: How Does a Fruit's Internal Ethanol Levels Affect External Rind Stress?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The goal of my project was to find the link between an orange's internal ethanol conditions and its external rind stress. I believe that the Wax category will do the best because it has a protective wax coating that protects it from harm and decay.</p> <p><b>Methods/Materials</b> I started the experiment by collecting oranges (TI Navel variety) from an orange grove. I took these oranges to a packing house, where I separated them into three different groups, called Control, No Wax, and Wax. No Wax was run through the machinery, while Wax was run through it with a waxing treatment as well. I then took these oranges to the USDA Field Station in Parlier, where I kept them in a temperature-controlled room at 50 degrees Fahrenheit. Once a week I weighed the oranges, checked the visual appearance, and tested them for pressure, solids, and taste. About once every three weeks, I sent oranges from each category to Pent-A-Vate Labs in Lindsay to have their ethanol levels measured. A few more of my materials included a penetrometer (for measuring pressure, measured in pounds) and a refractometer (for measuring solids, measured in degrees brix).</p> <p><b>Results</b> The Wax category had the highest ethanol level throughout the experiment, because its wax coating caused the oranges' ventilation to be cut off. However, the Wax group also had very little mold because the wax on it had fungicide in it. The No Wax category ended up in the worst physical shape, because the conveyor process bumped and bruised it, leaving it open to attack from mold spores without the fungicide protection of a wax coating. The Control group did the best as far as physical appearance and lower ethanol levels.</p> <p><b>Conclusions/Discussion</b> In the last ethanol test taken, there were two samples of 6-8 oranges per category instead of just one sample per category. One sample had the best-looking oranges of what was left, while the other had the worst. The sample with the nicer fruits had lower ethanol levels than the one that looked worse. This indicated that fruit with higher rind stress also had a higher ethanol levels. So, if orange packing houses wanted to decide where to send the oranges they have, they may want to check the ethanol level first, because if they sent fruit with higher ethanol levels overseas, it may not make the trip.</p>	
<b>Summary Statement</b> I wanted to find the link between internal ethanol levels and external rind stress, using a multitude of tests such as weight, physical appearance, pressure, solids, and taste.	
<b>Help Received</b> Stored and weighed oranges at the USDA Field Station in Parlier under the supervision of Dr. Joe Smilenack; Mother taught me painting techniques to decorate the board; Father drove me to and from the USDA Field Station; Dr. Patrick Malloy at Pent-A-Vate Labs measured ethanol levels of the oranges.	