



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> <b>Kenna R. Sandberg</b>	<b>Project Number</b>  29043
<b>Project Title</b> <b>External Orange Damage</b>	
<b>Objectives/Goals</b> The objective is to determine the critical freeze period for an orange. The goal is to identify the material that prevents an orange from freezing for the critical freeze period. <b>Abstract</b> <b>Methods/Materials</b> Twenty-four oranges are placed in the freezer for 1, 2, 3, 4, 5, 6, 7, and 8 hours. Every hour remove three orange out of the freezer and place them in a square, plastic container exposed to ambient temperature. Record which orange degrades first, measure and document amount of degradation. Once the critical freeze period has been identified, perform experiment two. Place six oranges in Bubble Wrap, Plastic Bag, Paper Bag, Cardboard Box, and Wax coated oranges in the freezer for the critical freeze period. Once the oranges have been frozen for the amount of time remove the oranges in the freezer, remove the wrappings, and place them in a square, plastic container exposed to ambient temperature. Based on the six insulating materials I used in this test procedure, I will monitor and record each material used for protecting against frost damage. 1st observance of degradation being the least amount of frost protection, six being associated with the material that provided the most amount of protection. At this point in my test procedure, I will categorize best to worst protective material in the critical freeze period. <b>Results</b> The critical freeze period is eight hours with an average mold growth of 5.33cm. The best protective material for an orange in the critical freeze period is Bubble Wrap with an average mold growth of 0.25cm. <b>Conclusions/Discussion</b> My first conclusion is that the critical freeze period is eight hours because the orange has more time to freeze than the lower hours. My second conclusion is that the protective material of an orange for the critical freeze period is Bubble Wrap rather than the other materials because the bubble wrap has small chambers of air incorporated into four layers of plastic to protect the orange.	
<b>Summary Statement</b> My project is about the critical freeze period and the material that prevents orange damage for the amount of freeze time.	
<b>Help Received</b> Mother helped with board; Teacher reviewed work.	