



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) John Thomas; Peter Zellman	Project Number J1333
Project Title How Do Different Temperatures Affect the Fermentation Rate of Yeast?	
Abstract Objectives/Goals We assessed how different ambient temperatures affect the fermentation rate of yeast. We also observed how yeast minerals and nutrients affect the rate of fermentation. Beginning with the 2003 harvest, there is an over-supply of California winegrapes that exceeds the tank capacity of wineries to ferment into wine. One application of our research could be to determine the best temperature to ferment the grapes so that if we could increase the rate of fermentation it would free up tank space for more winegrapes to be harvested. Methods/Materials We established five temperature treatments (0, 10, 20, 25, 30C). Each temperature treatment consisted of three replicates. Each replicate was a 1.5 liter vessel of sodium-free, non-chlorinated water. For each replicate we added: 150gm of corn sugar; 10gm of diammonium phosphate (DAP); 5gm Fermaid K; and, 3gm of Pasteur Champagne strain yeast. We stirred until all clumps dissolved. We repeated procedure for each treatment. For nitrogen and nutrient starvation trial we did not add Fermaid K or diammonium phosphate. Each treatment (three replicates) was placed in the appropriate temperature controlled water bath for the duration of the experiment. We took hydrometer (Brix) and temperature (C) readings three times per day (7A, 4P and 9P.) Results The fermentation rate increased with temperature. The fermentation never began for the 0C treatment. We would like to determine at what temperature (between 0 and 10C) yeast would begin fermentation and if the yeast would die if we increased the temperature to 40 or 50C. Conclusions/Discussion From our data tables and graph of fermentation rates, it appears that the fermentation rate roughly doubles for each 10C rise in temperature. This was predicted by the temperature coefficient rule of Q10. However, there is the exception to this rule for the change in temperature from 0C to 10C. At this time, the 0C has still not begun fermenting.	
Summary Statement The fermentation rate of Pasteur Champagne yeast roughly doubles for each 10C increase in temperature.	
Help Received My dad helped us buy our materials and advised us in our project.	