



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Kirin Debnath	Project Number J0506
Project Title Making Better Bread by Modifying a Yeast	
<p style="text-align: center;">Abstract</p> <p>Objectives This project tests the hypothesis that yeast (<i>Saccharomyces cerevisiae</i>) lacking mitochondria will make larger and fluffier bread.</p> <p>Methods Materials: Conical Tubes, Glycerol (YPGE) Petri dishes, Glucose (YPD) Petri dishes, Balloons, Yeast Extract-Peptide-Dextrose Media (YPD), Ethidium Bromide, Wild-type yeast, Flour, Water, Sugar. Equipment: 30C incubator, 30C shaker, spectrophotometer, delta vision imager, conventional oven. Methods: To remove mitochondria, wild type yeast was treated with ethidium bromide to remove and block mitochondrial function. After ethidium bromide treatment for 18 hours, yeast were cultured on glucose plates and colonies were grown out. Individual colonies were then plated on glycerol to identify colonies that cannot grow due to lack of mitochondria. These yeast strains are known as Rho0. Then, equal amounts of control wild type and Rho0 yeast were mixed with 50g of dough mixture (flour, water, and sugar) and left to rise for 18-20 hours at 30C. Next, the volume of the dough was measured. Finally, the bread created from wild type and Rho0 yeast was baked in an oven (at 375F for 25 minutes) and the area of bread slices was calculated.</p> <p>Results The slice area of bread made from wild type yeast measured 11.60+/- 2.83 sq.cm (average +/- standard deviation), whereas the slice area of bread from Rho0 yeast measured 20.30 +/- 4.41 sq.cm. Thus, Rho0 yeast leads to bread that is 75% larger than bread made from controls. In addition, I observed that Rho0 bread had many more holes, which bread makers refer to as a better crumb .</p> <p>Conclusions In conclusion, Rho0 bread lacking mitochondria does make larger, and fluffier bread. I predicted this because previous work has shown that Rho0 yeast exhibit increased fermentation which leads to increased carbon dioxide production which makes the holes in fluffy bread.</p>	
Summary Statement Yeast lacking mitochondria, called Rho0, make larger, fluffier bread due to Rho0 yeast having increased fermentation.	
Help Received I used Dr. Jayanta Debnath s lab at USCF. Dr. Ariadne Vlahakis a postdoc taught me the techniques to culture yeast and supervised me when I created Rho0 strains. She also helped me with the statistical analysis of my bread slice data.	