



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

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| Name(s) Chrysanthe N. Frangos | Project Number 36545 |
| Project Title Using Rice and Silica Gel in the Prevention of Bread Mold | |
| Abstract Objectives/Goals The objective of this project was to see if rice can safely and effectively delay or prevent the forming of mold on stored, preservative-free bread. Rice is a known desiccant used in salt shakers to absorb excess moisture and prevent clumping. Many cultures twice bake bread (biscotti, zwieback) as a form of preservation. The combination of these two ideas helped me form this project. Methods/Materials To conduct this experiment, I home baked loaves of preservative-free bread. Half slices of this bread were placed with packets of rice, silica gel (positive control) or empty bags (negative control), 10 samples for each group. Over nine days, I took pictures of the surfaces of the bread with my iPad. I analyzed the pictures using the National Institutes of Health ImageJ image analysis software. To calculate the percentage of mold on the bread, I found the total number of pixels in an area of bread and compared it to the number of darker pixels within that area (mold), as determined by the ImageJ brightness thresholding process. In a follow-up experiment, I determined the most effective dose of rice. Bread slices (5 each) were placed with 0, 20, 40, and 80g of rice. To determine if rice's desiccant properties can be regenerated, I heated packets (5 each) of rice at two different oven temperatures (150 and 180 deg F), weighed every 20 mins, and in the microwave, weighed every 30 secs. Results The results were dramatic. In the negative control group, mold was evident on Day 7 and continued rapid growth into Day 9. Silica gel completely prevented mold from forming throughout the experiment. Rice (used in a 40g dose) delayed the formation of mold by two days and reduced the amount of mold by 80% on Day 9 in comparison to the negative control group. In the follow-up experiment, I discovered that, generally, the greater amount of rice, the less mold. All methods of heating removed moisture from the rice, but heating at 150 deg F was found to best retain rice's hygroscopic properties. Conclusions/Discussion My studies indicate that even though rice does not prevent mold to the same extent as silica gel, it is a safe and effective tool in keeping bread from molding over a prolonged period of time. While twice-baking bread results in a hard cracker, the use of rice reduces just enough moisture to maintain the bread's quality. By extending the shelf life of preservative-free bread, less bread will be wasted. | |
| Summary Statement I found that the hygroscopic (desiccant) properties of rice prevented mold growth on preservative free bread in a safe and natural manner by comparing it to the known desiccant silica gel. | |
| Help Received I conducted the experiments, baked the bread, weighed the materials, took and analyzed the pictures on ImageJ, recorded and analyzed the data. I received help from my parents and my teachers, Ms. Jennifer Lambert, Mrs. Debra Cota, and Mr. Eric Allen, in the editing of my papers. | |