CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J0512

Project Title
Acids' Relationship to Mass and Height: Which Cupcake Brings Delight?

Abstract

Objectives/Goals
In baking a cake, it is important that all ingredients are configured correctly in order to produce an attractive and edible cake. Acids are significant in this configuration. Finding the acid that provides for a tall, heavy cake will help the product both taste of a higher quality and sell more proficiently in stores. The consumer will also be receiving more product for their money.

Methods/Materials
I tested this problem by taking a chocolate cupcake recipe and substituting the acid call for, vinegar, with buttermilk, limejuice, lemon juice, and cooking sherry. After the eleven cupcakes had baked I proceeded to find the height and mass of each individual cupcake. I controlled this by using the same cupcake recipe, the same amount of acid in each of the 5 experimental trials, weighing each cupcake to be certain that each cupcake entered the oven at 55g, putting the same amount of pressure on each cupcake while finding the height, and cleaning all materials after each trial. While analyzing my data, I found it very interesting that the mass of each cupcake was reduced from 55g after being baked. In my experiment the independent variables were the five acids and the dependent variables were the height and mass of each cupcake.

Results
After averaging my data, I was able to conclude that the limejuice when mixed with baking soda provided for the tallest cupcake with an average of 4.6 centimeters. Cooking sherry averaged the largest mass at 50.5 grams.

Conclusions/Discussion
In conclusion, part of my hypothesis was proven correct. The cupcakes containing vinegar did in fact average the largest height. The cupcakes containing cooking sherry averaged the largest mass. I believe this to be true because during the leavening process, air bubbles are formed within the batter and expand when exposed to heat. The most acidic acid will have the largest reaction with the baking soda causing the air bubbles to expand more than the other acids. Because the air bubbles are larger, more water has the ability to evaporate from the cupcake.

Summary Statement
The purpose of my project was to find an acid that produces both a tall and heavy cupcake when mixed with baking soda.

Help Received
Mrs. Marcarelli helped both with procedure and written work; Mr. Negus assisted with procedure; Parents assisted monetarily; Mr. Budzynski helped with graphs