Salt and Salt Alternatives’ Effects on Muffins

Salt has been thought to be a contributor to a number of physical problems. Sodium chloride is the chemical name for it, and many think that it is the sodium that causes these problems. After much research, salt alternatives have been developed to replace the sodium with healthier, non-problematic substances. These alternatives have not had as much experimentation as they could with regards to texture, color, and other consumer preferential differences between the original and those alternatives. This experiment will test those differences. Three different batches of muffins were made with salt and two alternatives (a generic salt substitute and LiteSalt). The alternatives were compared to muffins made with normal salt. Each batch of muffins was tested by the texture analyzer, measured for height for comparison, and sensory tested by panelists. There were no solid conclusive evidence that any of the products were better than the others; however, salt did have a higher taste panel preference, especially when the panelists were allowed to give freehand comments on their score card. Many stated that the alternatives were bitter. These findings show that the alternatives are comparable to salt, but salt tends to be more of a favorite and gives a stronger texture than the alternatives.

Introduction:

Salt is one product that is abundantly used in cooking. According to Dr. Darling, salt has a strong association with high blood pressure, yet it's not conclusive. (2005). Jackson Gastroenterology also mentions that sodium can not only cause high blood pressure but hypertension as well (2002). The Blood Pressure Association believes that too much salt "worsens thinning of the bones (osteoporosis), asthma and kidney disease and is closely related to cancer of the stomach" (2005). With the evidence that specialists have collected, there are signs of a need to decrease sodium intake. Changing the way people cook is one way to change this; however, salt is one product that is important to many things in cooking. One of the reasons salt is used in muffins is for the taste value. It also is a preservative and "...gives proper texture to processed foods, serves as a control agent to regulate the rate of fermentation in food processing, strengthens gluten in bread, provides the color, aroma and appearance consumers expect..." (Salt in Food, 2005). Alternatives are being used in place of salt to keep people healthier and still retain the taste and texture benefits like in products with real sodium chloride. Some believe that the alternatives will not give the same taste and, considering consumers do prefer the salty taste of foods, it will not taste as good. This will be proven through taste panels made up of fellow students. The texture will also be harder in the non-control. Using the texture analyzer set to the muffin setting pre-specified in the program with the cone probe, information will be found about the difference in texture between the different salt products. Also, using the same amount of product in each muffin sample, those with substitutes
will not rise up as much in volume once they're cooked. This will be proven using
devices like calipers, or other measuring devices, to measure the highest point of
the muffins. During the experiment, the two salt alternatives will be used in the
same quantity as the normal salt. Comparing two salt alternatives, LiteSalt and a
generic salt substitute, it will be shown how the alternatives are different than the
original product. By doing this experiment, information can find out if the
alternatives' claims are valid that they act just like original salt.

Methods:
Recipe and cooking:
Recipe:
2 cups flour
1 ½ cup baking cocoa
½ cup sugar
2 tsp baking soda, pressed through a sieve to remove lumps
½ tsp salt
2 2/3 cups milk
2/3 cup vegetable oil
2 large eggs
1 tsp vanilla
Directions for recipe:
Preheat oven to 400 degrees F. Coat muffin tins with non-stick
cooking spray or use muffin papers. In a large bowl, combine the dry
ingredients. In a separate bowl, combine the liquid ingredients and whisk
until smooth. Fold into the dry ingredients just until moistened. Don’t
overmix. Scoop the batter evenly into the prepared pan. Bake at 400
degrees F for 20-22 minutes or until a toothpick inserted in the center
comes out clean. Cool on a wire rack before removing from the pan.

By cutting a standard chocolate muffin recipe (see above) in half
for waste sake, each of the three trials were conducted the same. They
were created at the same time to insure accuracy. Vegetable oil was used
for the oil that was required. Once each of the steps were followed to
create the liquid form of the muffins, they were all placed in muffin tins
with normal muffin papers. After adding a minimum of 37.0g to a
maximum of 37.5g to each of the muffin papers, they were all put in the
oven at 400 degrees F. These were allowed to cook for exactly 20 minutes
timed on the oven timer. They were taken out and shortly after they were
able to be handled due to the heat, they were subjected to analysis testing.
Sampling and Sensory Testing:
Randomly selected taste panelists were asked to sample the
products of each test. New people were asked each time to try the different
trials to ensure non-biased information. The bags, or plates, of muffins
were set in a triangle to rule out middle selection bias. Each bag, or plate,
was given a three digit number picked at random by the experimenter,
making sure that each number started with something other than 1, 2, and
3 in the same experiment. The attached sensory card is an example of what was given to each of the tasters. The taste panelists were asked to fill out their blank cards to make sure there was no middle selection bias. General comments of each muffin tried were allowed at the bottom of the card to get further information on why each was ranked.

Texture analyzer:

Each of the muffins in each trial were tested by the texture analyzer two different times using the cone probe and muffin sample preprogrammed into the computer. These were done within 10 minutes of the muffins coming out of the oven.

Height measurement:

Each muffin was measured by height by using the centimeter side of a ruler. This was measured from the very bottom to the tallest part of the muffin, which was usually the center of the muffin.

Replications:

This experiment was done on three different days. With one experiment set including all three types of muffins (salt, Salt Alternative, and LiteSalt), each set was cooked at three different times on different days to ensure accuracy.

Discussion:

The results were averaged to ensure accuracy. The sensory scores were added up and averaged per trial, as mixing the trials could create inaccurate numbers. Once averaged, they were compared and made into a graph on the attached pages. The texture analyzer and height numbers were added and averaged and compared in the same way as the sensory cards.

As the Salt Institutes website claims, salt helps to strengthen gluten. It was found that salt had a higher force in the texture analyzer. This is shown in Graphs 2a, 2b, and 2c. This higher force also gives a likable texture as explained in Graphs 1a, 1b, and 1c. Overall, the texture was rated in the sensory tests almost as good as, as good as, or better than the salt alternatives. All of the other sensory tests were rated about the same or they were inconclusive. The general comments at the bottom showed that most tended to say that the salt alternatives tasted about the same and the panels liked the salt overall better. There were comments of the salt alternatives tasting bland or bitter. Considering all of the batches of muffins were made at the same time in each experiment, in Graph 1b, preference was .7 of a point above the next one showing that salt may have a higher likableness compared to the alternatives.

The third test done on the muffins was height, shown in Graphs 3a, 3b, and 3c. There were no extreme differences when comparing all of the graphs and experiment results. The only somewhat conclusive evidence is that normal salt was either first, a close second, or tied with one of the alternatives, showing that normal salt benefits height a lot better than the alternative salts.

Error could be due to a number of different reasons. Since these were done on different days, humidity or lab conditions could skew the results. Faulty equipment, bad lab supplies or old food, human error when reading the testing equipment, or not putting the recipe together in exactly the same way as the other days are other examples of
potential error. Too much sugar, too much salt, or any other incorrect amount by even a fraction of a gram could cause a number of reactions.

The project appears to be somewhat successful. Salt alternatives seemed to not make significant difference; however, salt tends to be more of a favorite. Those panelists that did not like the alternatives may have a stronger bitter sense. Overall, salt alternatives tend to be a little different than normal salt as far as some aspects go, like texture and preference. In future experiments of this type, it’s suggested that more than three trials are done to ensure accuracy.

Results: See Attached Pages

References