Patricia Little
F&N 453
Individual Project
“The Effects of Milk Alternatives on Biscuits”
21 November 2005
I. The Effects of Milk Alternatives on Biscuits

II. Abstract:

In today’s society many people are searching for ways to improve their health and diet. While many contend that cow’s milk is not bad for you and some even say it is really good for you there has been an increase in milk alternatives. Originally this was probably in response to the allergic reaction some people had to cow’s milk, however, while doing research for this project it was found that there are also health benefits to using rice and oat milk as an alternative to traditional cow’s milk. For this experiment traditional cow’s milk was used and then substituted with rice and oat milk in a biscuit recipe to see if they were acceptable alternatives. Texture analyzer using a cone probe, moisture content machine and sensory evaluation were used to determine the effects the substitutions had on the biscuits. Overall the use of rice and oat milk was acceptable alternatives however oat milk received higher scores on the hedonic scale used in the subjective evaluation.

III. Introduction:

In this experiment the effects of milk alternatives on Bisquick biscuits was determined. This was done for two reasons. Originally it was to see if they were acceptable alternatives for those who were allergic to traditional cow’s milk. However after doing some research there also seemed to be some health benefits to the milk alternatives that were chosen for this project; oat and rice milk. With today’s society looking for ways to be healthier the substitution of rice or oat milk for traditional cow’s milk could benefit
their heart health. While this has been shown in previous experiments it does no good if they are not acceptable alternatives taste and texture wise they do no good.

By doing this project hopefully it will be determined if rice and or oat milk are acceptable alternatives to traditional cow’s milk in a biscuit recipe. To determine if rice and oat milk are acceptable alternatives for traditional cow’s milk, the Moisture Content machine, Texture Analyzer using the cone probe set to the muffin setting and a test panel using a hedonic scale.

IV. Method:

For this experiment the recipe for Bisquick biscuits was used. This was done to help eliminate errors in measuring multiple ingredients. The recipe is as follows:

125 grams Bisquick mix

88.875 milliliters milk (oat, rice or 2%)

After placing these ingredients in a bowl a hand mixer was used to beat it into a batter. The mixer was used at the highest speed (5) and was mixed for four minuets. Once the batter was complete one fourth a cup of batter was placed into each muffin tin spot. Muffin tins were used because the variation with rice milk was too runny to bake them as drop biscuits or to use a biscuit cutter. For each variation a different color muffin paper was used and each trial was numbered. The biscuits were then placed in the oven at three hundred and fifty degrees Fahrenheit for seven minuets. Once baking was complete the biscuits were removed from the oven and allowed to cool. After cooling the samples were tested by subjective and objective methods. The objective methods used were the
Texture Analyzer using the cone probe set on the muffin setting and the moisture content machine. A test panel using a hedonic scale was used for the subjective test.

In this experiment the procedure was repeated three times. This is to help improve the credibility of the tests. To randomize the sampling of the products the different products were presented in different orders each time.

V. Discussion:

As stated earlier it was only after doing research that a medical reasoning for using rice or oat milk as a substitute for traditional cow’s milk came to light. Originally, the project was to figure out if they were acceptable alternatives for those who were allergic to cow’s milk. Another problem that was not foreseen was the consistency of the batters. At first the biscuits were to be baked as drop biscuits or cut with a cookie cutter. After preparing the first trial it was clear that the batter made with rice milk was far too runny to do bake them this way. To solve this problem muffin tins were used.

In the research done for this project it was found that oat milk has been linked to increased LDL levels and decreased HDL levels (G. Onning et. al, 1998). This cow's milk alternative is high in soluble fiber and is low in fat naturally. Rice milk like oat milk is naturally low in saturated fat. Both rice and oat milks have no cholesterol or lactose naturally unlike cow's milk (Rothschild, 2005). However no research was found on studies where these milk alternatives were used in baked goods and tested. One article did however test viscosity and related rice milk to being more satiating than cow's milk (K. Russell, 2004). Rice milk has also been found to not cause problems for children allergic to cow and soy milk (A. Fiocchi, 2003).
After testing the different milk substitutes using two percent cow’s milk to compare them to it was found that either milk could be used as an alternative in this biscuit recipe. The results from the texture analyzer tests, shown in figure one and table one, show that rice and oat milks both gave results lower that those produced by the biscuits using two percent milk. The average grams of force for the two percent milk variation were 102.03 grams. The rice variation gave an average reading of 55.23 grams of force while the oat milk variation gave a reading of 49.7 grams of force. From this data you can see that rice and oat milk required less force for the probe the puncture the product; more than half the force was required. This tells us that the products produced by using rice and oat milks in place of the two percent milk were softer. Moisture content, shown in table two and figure two, however, produced values for all products that were very similar. Comparing the averages of the different trial the difference between two percent cow’s milk, rice milk and oat milk are about two hundredths different. Using the subjective data obtained from the hedonic scale it was determined that the oat milk was the more preferred alternative. Rice milk was rated significantly lower than oat milk or two percent milk. The biscuits made with oat milk were rated only one tenth lower than those made with two percent milk. To obtain these values the terms used on the hedonic scale were given values zero for neither like nor dislike, positive numbers increasing by one for increasing likeability and negative numbers decreasing by one for decreasing likeability. These numbers were then averaged to obtain the values indicated in table 3; the subjective data is also included at the end of this report.
From the data that was produced during this experiment you can conclude that rice and oat milk would be acceptable alternatives to the use of cow’s milk in biscuits based on the objective data.
VI. Results:

Table 1. Texture Analyzer values for 2%, rice and oat milk in biscuits

<table>
<thead>
<tr>
<th></th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% Milk</td>
<td>116.2</td>
<td>87.7</td>
<td>102.2</td>
<td>102.03</td>
</tr>
<tr>
<td>Rice Milk</td>
<td>63.1</td>
<td>53.3</td>
<td>49.3</td>
<td>55.23</td>
</tr>
<tr>
<td>Oat Milk</td>
<td>28.2</td>
<td>39.5</td>
<td>49.7</td>
<td>39.13</td>
</tr>
</tbody>
</table>
Figure 1. Texture Analyzer values for 2%, rice and oat milk in biscuits
Table 2. Moisture Content values for 2%, rice and oat milk in biscuits

<table>
<thead>
<tr>
<th>Moisture Content (Aw)</th>
<th>2% Milk</th>
<th>Rice Milk</th>
<th>Oat Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>0.846</td>
<td>0.845</td>
<td>0.837</td>
</tr>
<tr>
<td>Trial 2</td>
<td>0.856</td>
<td>0.836</td>
<td>0.826</td>
</tr>
<tr>
<td>Trial 3</td>
<td>0.9</td>
<td>0.885</td>
<td>0.88</td>
</tr>
<tr>
<td>average</td>
<td>0.867</td>
<td>0.855</td>
<td>0.848</td>
</tr>
</tbody>
</table>
Figure 2. Moisture Content values for 2%, rice and oat milk in biscuits
Table 3. Average likeability based on answers from subjective test

<table>
<thead>
<tr>
<th>Variation</th>
<th>Likeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% milk</td>
<td>1.27</td>
</tr>
<tr>
<td>Oat milk</td>
<td>1.17</td>
</tr>
<tr>
<td>Rice milk</td>
<td>0.61</td>
</tr>
</tbody>
</table>
Figure 3. Average likeability based on answers from subjective test
VII. References


Suggestions for future work:
- Knowing that milk substitutes worked in biscuits, you could look at milk substitutes in other baked goods.
- Determining if there is a better proportion of rice milk to flour mixture (Bisquick) to get a more typical biscuit batter.