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Written Report

The Effect of the Addition of Fiber to Gummy Candies

Abstract:

The objective of this experiment was to add psyllium fiber to gummy candies without sacrificing taste or texture. Fiber has been shown to have a multitude of health benefits ranging from lowering cholesterol to improving GI health. A simple recipe involving Jell-O, gelatin, and water was used to which we added 5 and 10 g of fiber. Three trials were conducted, each including a control variable as well as the 5g and 10g variables. The gummies were subjected to tests by the Texture Analyzer, Water Activity Machine, and Hunter Colorimeter, as well as a hedonic ranking scale that was included in a survey taken by volunteers. The results from these tests showed that with the addition of fiber, the gummies got chewier and their water activity decreased, while the color was not greatly affected. The 5g variable was the most preferred, but just barely over the control. The 10g variable was the least preferred based on texture. It would be possible to add small amounts of fiber to gummy candies, but if the amounts were substantial the texture is altered enough to make them no longer desirable.

Introduction:

Dietary fiber is found in plants, and in the past few decades more and more emphasis has been put on increasing our intake of fiber due to numerous health benefits. Fiber acts by changing the nature of the contents of the GI tract, and how certain nutrients and chemicals are absorbed (King, DE). Some benefits include: adding bulk to your diet, making you feel full faster, lowering total and LDL cholesterol, reducing blood sugar, and balancing intestinal pH. These effects can lower the risk for heart disease and diabetes, as well as reduce the risk for certain colon and other cancers (de Mello VD).

Due to these health benefits, fiber is being added to an increasing number of foods. The most common forms of fiber found in foods are psyllium, beta-glucans, inulin, and many others. We chose to add psyllium to gummy worms. Psyllium is most commonly found in the product Metamucil, which is a bulk-producing laxative and fiber supplement. In a study titled, “Serum lipid responses to psyllium fiber: differences between pre- and post-menopausal, hypercholesterolemic women” psyllium was shown to be more effective than other popular fibers for certain problems, such as irritable bowel syndrome. It should be fairly easy to add this fiber to gummy candies without significantly affecting texture or taste.

Methods:

In order to perform this experiment the following recipe was followed to produce the gummy candies. Each variable was made three separate times. Throughout the experiments, gummy candies were randomly selected for testing
and taste panel sampling. All of the variables were tested three different times for all objective and subjective measurements.

Ingredients:
1 – 3 oz box of orange flavored Jell-o
2 – ¼ oz packages of unflavored gelatin
1/3 cup water
Candy Molds

1. In a sauce pan, pour water and sprinkle Jell-o and gelatin on top. Let sit for 5-10 minutes.
2. Place sauce pan over medium heat and stir until gelatin dissolves for about 2-5 minutes.
3. Once mixture is liquid and gelatin is dissolved remove from heat and transfer into an easy to pour from container.
4. Pour mix into candy molds. Let cool for about 20 minutes. Then remove from molds.

The first variable was done exactly as the recipe above states. The second research variable had 5 grams of Metamucil Orange Smooth added to the mixture in the first step of the recipe. This is a fiber that is made up of psyllium. The third variable had 10 grams of the same Metamucil was added to the gummy candies during the first step of the recipe.

After the gummy candies were made, each variable was put through various testing. First, each variable was run through the water activity machine. In order to prep that candies for the water activity machine, the candy molds were tested to make sure the end product gummy candies would fit inside the cups that are inserted into the water activity machine. After the sample is placed in the cup and placed into the water activity machine, the chamber is closed and locked. Then the machine reads the water activity of each candy.

Next each gummy candy variable was tested using the texture analyzer. All three trials for each of the variables were tested. In order to assess the texture, the cone probe was used.

The last of the objective measurements was the hunter colorimeter. In order to run this test, each variable was run for all three trials. Numerous gummy candies were placed in a petri dish so that the whole bottom of the dish was covered. Once the dish was covered, it was placed on top of the hunter colorimeter and was then read. The values collected were the L, a, b values.

In order to gather subjective data, we conducted a taste panel. The taste panel was held in Stone Hall. The following scales were used in order for each
participant to assess the three variables of gummy candies. The taste panel was performed for each of the three trials.

Taste Panel Sensory Testing:

Please taste the following samples and rank them on each scale.

514

Extremely Chewy                             Extremely Hard

310

Extremely Chewy                             Extremely Hard

725

Extremely Chewy                             Extremely Hard

Please rank the following samples in order of preference. 1 being the most preferred and 3 being the least preferred.

_____514

_____310

_____725
Results:

Figure 1: Texture Analyzer - In this graph, the texture analyzer data was assessed for the three different trials. Upon assessment, there was a significant difference between the control samples and the samples with 10g of fiber ($p>0.05$). The $q$ value obtained for the control vs. 10g fiber was equal to 5.832 when assessed in InStat. Standard deviations are shown in the chart.

Figure 2: Hunter Colorimeter Trial 1 - In this chart, trial one of the hunter colorimeter data is shown. No values could be obtained from InStat. The standard deviations are shown in the chart.
Figure 3: Hunter Colorimeter Trial 2 - In this chart, trial two of the hunter colorimeter assessment is shown. p-value and q-value could not be obtained using InStat. The standard deviations are shown.

Figure 4: Hunter Colorimeter Trail 3 - In this chart, data collected from the third Hunter colorimeter trial are shown. The standard deviations are shown. p-value and q-value could not be obtained.
Figure 5: Averages of Hunter Colorimeter data – In the above chart, the averages of all three hunter colorimeter trials are shown. Standard deviations are also shown.

Figure 6: Water Activity – The chart above shows data collected from the water activity machine. The difference between the control and 10 g of fiber data were found to be significant in InStat (p<0.01). This was with a q value of 9.279. Also, the difference between 5g and 10g of fiber were found to be significant (p< .05). This is with a q-value of 5.458.
Figure 7: Hedonic Scale Ranking – The chart above shows the results from 31 people taking a survey asking them to rank the 3 samples in order of preference. Number 514 corresponds to the control, 310 to the 5g variable, and 725 to the 10g variable.

Discussion:

When looking at gummy candies it is important to maintain not only taste but also an optimal texture, as many people would agree that if a gum based candy is too chewy or hard it is not desirable. The results from this study show that with the addition of fiber to the gummy candies, they got chewier and overall less desirable, based on a series of objective and subjective tests. In figure 1, results from the Texture Analyzer are shown, and indicate that as we added fiber to the recipe, more grams of force are needed. This means that as the amount of fiber increases, the gummies get more and more chewy. There was a significant difference between the control and the gummies with 10g of fiber, but not between the control and the 5g variable.

In figures 2, 3, 4, and 5, results from the Hunter Colorimeter are shown. All three trials were fairly consistent, and showed the same trends for all three variables. While no values could be obtained from InStat, it is unlikely that there is a significant difference between any of the variables based on the similarity of the results obtained from each trial. Figure 5 shows the averages of the three trials and indicates very small standard deviations, especially for the b values. This fact further supports the unlikelihood of finding a significant difference. Based on these outcomes, one can infer that the addition of fiber to the gummy candies did not greatly affect color.

In figure 6, results from the Water Activity Machine are shown. Each trial consistently shows a decrease in water activity with the addition of fiber. The difference between the control and 10g variable as well as the difference between the 5g and 10g variables were both found to be significant, with q-values of 9.279.
and 5.458. This supports the earlier finding of the increase in chewiness as fiber content increased, because the less water activity a food has, the chewier or harder it will be.

In figure 7, results from the hedonic ranking scale that was used are shown. The survey was taken by 31 people, and showed a fairly wide range of tastes. By analyzing these results, it could be determined that 310 was the most liked, having the highest “most desirable” rankings (tied with 514) but having the fewest “least desirable” rankings. The least liked was 725, having a few “most desirable” rankings, but having the most “least desirable” rankings. This correlates well with the earlier results that found the 10g variable to be the chewiest. The fact that the 5g of fiber variable was the most liked indicates that a small amount of fiber can be added without taking away from taste and texture.

References:


