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Sensory Evaluation of Brownies Prepared with Different Types of Fat

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Sensory Evaluation of Brownies with Alternative Fat Sources

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Abstract

Background: Cardiovascular disease (CVD) is the number one leading cause of death in current society due to the popularity of high consumption of fatty foods which affects the heart. Many dietitians and other health care professionals suggests the in order to decrease the risk for CVD the patients must lower the consumption of saturated fats in the diet and replace them for healthy fats such as monosaturated and polysaturated fats. With providing patients a lower fat/ saturated fats options and still appealing food alternative, it can help lower the risk for heart disease.

Methods: There was a total of 26 participants. Results from the scoreboards were collected and put into an excel spreadsheet to organize the data and to create tables and graphs. Average scores were run over each category and standard deviations as well. Nutritionist Pro was used to analyze macronutrients.

Results: Color- butter was the highest ranked with 46% of the participants stating that it had a "very dark brown or black" with olive oil coming in second place. Aroma- amongst all the variables, 57% of the participants reported that applesauce had the highest "slight aroma". 61% stated that butter was the most tender and moist, with olive oil in second place. The best overall flavor was butter and applesauce were ranked the lowest with "unsweet flavor". Applesauce had the highest distinct aftertaste, with avocado following it.

Conclusion: Overall, the butter control had the best results. Due to the similarity structure, olive oil came in second place. Regarding the nutrient analysis the variables with less fat were avocado and applesauce.

Purpose of Study

To examine the effects of butter, olive oil, avocado, Greek yogurt, and applesauce on different aspects such as color, aroma, tenderness, texture, flavor, and aftertaste of a normal chocolate brownie.

Introduction

Heart disease is the leading cause of death for men and women in the United States. According to the CDC, one person dies every 36 from CVD.[1] Most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet, obesity, and physical inactivity.

A 2015 study determined that people who replace 5% of their saturated fats with polyunsaturated fats, which are the good fats found in nuts, seeds, and fish, are at 25% less risk of heart disease. And those who replace the same percentage with monounsaturated fats that are found in red meat, high fat fruit, and sunflower oil, can lower their risk of heart disease by 15%. [2]This project is about finding a solution to a prominent problem: loving sweets and trying to monitor fat intake.

Overall excess of of any type of fat can result in weight gain and health diseases such as CVD. Saturated fats are known for negatively affecting blood pressure, triglycerides and cholesterol levels. Monosaturated fats are known for reducing bad cholesterol levels, which can lower risk of heart disease and stroke. They also provide nutrients to help develop and maintain your body's cells. Polyunsaturated fats are lowering low-density lipoproteins which helps reduce risk for CVD. In this research the different fat substitutes are options with lower cholesterol levels than the control, butter.

Methodology

For this experiment the selected dessert was brownies and there were four different variables. The control recipe, as seen in Table 1, uses butter as the fat. The variables consisted of olive oil, Greek yogurt, avocado, and unsweetened applesauce.

Table 1. Ingredients for the control brownie mix.

Quick and Easy Brownie Recipe

1 c. butter
2 c. white sugar
½ c. cocoa powder
1 tsp. vanilla extract
4 eggs
1 ½ c. all-purpose flour
½ tsp. baking powder
⅓ tsp. salt

The first variable used a 1:1 ratio of olive oil for butter. The second variable used 1/2 cup of butter and 1/2 cup of plain, Greek yogurt in the place of 1 cup of butter. One cup of mashed avocado was used as the final variable.

All the mixtures were prepared first and then all the batches were put in the oven at the same time. In the recipe for the control, it stated that the cooking time was going to be thirty minutes. The control batch and olive oil took about forty-five minutes to finish baking. The three other batches took 30 minutes to cook. All the five batches cooled down for fifteen minutes and later were cut into small squares to be given out to subjects.

Figure 1. The different batters, its applesauce, olive oil, and the butter (from left to right)

Figure 2. the final product. Top row (left to right) avocado, applesauce. Bottom row (left to right) Greek yogurt, olive oil.

For the subjects to grade each batch a scoreboard was created. As seen in Table 2., there were six different categories to grade the brownies. The categories included were color, aroma, tenderness, texture, flavor, and aftertaste. Twenty-five scoreboards were printed to be giving out to subjects. Each variable and the control had a different code number printed in the scoreboard to prevent any preconceived biases from the subjects. The control code was 872, olive oil code was 504, avocado was 870, Greek yogurt was 901, and applesauce was 702. All these codes were selected randomly in order to prevent any biases in the grading process. The control category was put third to help lower the chance of any biases.

Methodology

Characteristics	Sample				
	504	870	872	901	702
Color 1-Dull 3-Brown/ Golden 5- Very dark brown/black					
Aroma 1-None 3-Slight 5-Strong					
Tenderness 1- Extremely crumbly 3-Easily broken 5- Tough, hard to break					
Texture 1- Very dry 3-Moist 5- Mushy					
Flavor 1-Unsweet 3-Pleasing 5- Too sweet					
Aftertaste 1-None 3-Slight 5- Distinct					

Table 2.. Scoreboard.

Figure 3. The judge's plate with the different variations and codes.

Results

The subjects evaluated each variable according to the scoreboard categories. For the color, the control and olive oil had very similar color and ranked the highest in having a very dark color. The next category was aroma and the highest variable for no aroma was applesauce. Regarding tenderness, the variable with the highest scoring was applesauce with butter and Greek yogurt falling in second place. The control was ranked the highest for overall best texture with olive oil being second, see Figure 4. Greek yogurt, applesauce and avocado variables were scored closed to each other on the category of pleasantly overall flavor. See Figure 5. The last category evaluated was aftertaste. For this butter, olive oil, avocado, and applesauce ranked the highest for no aftertaste.
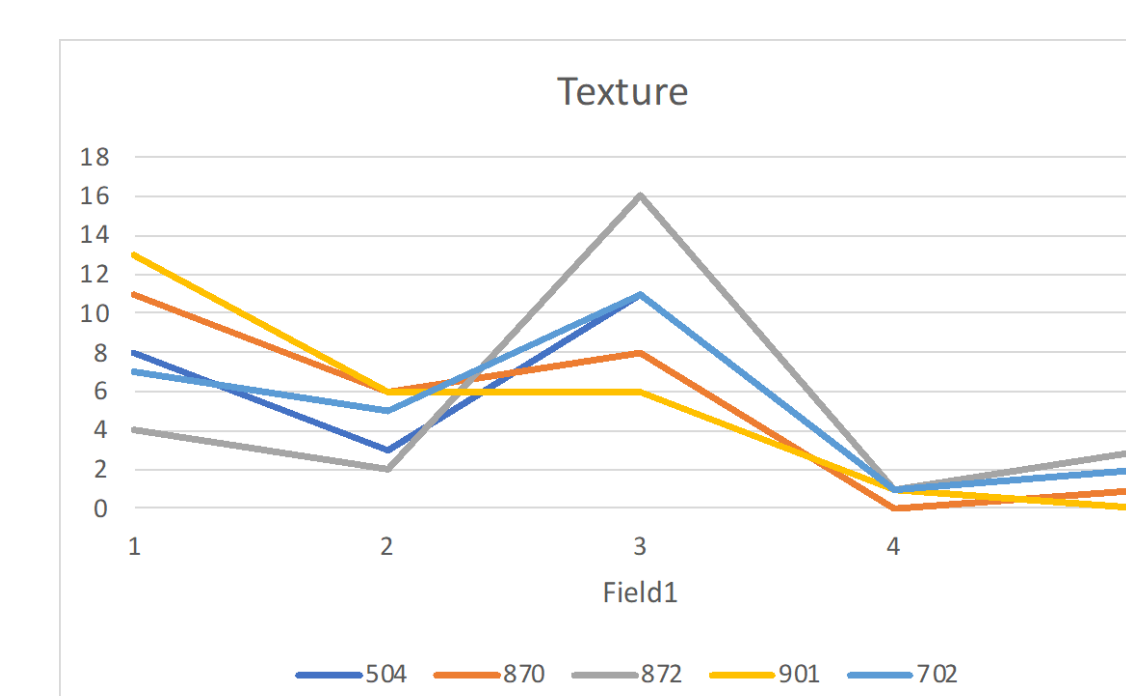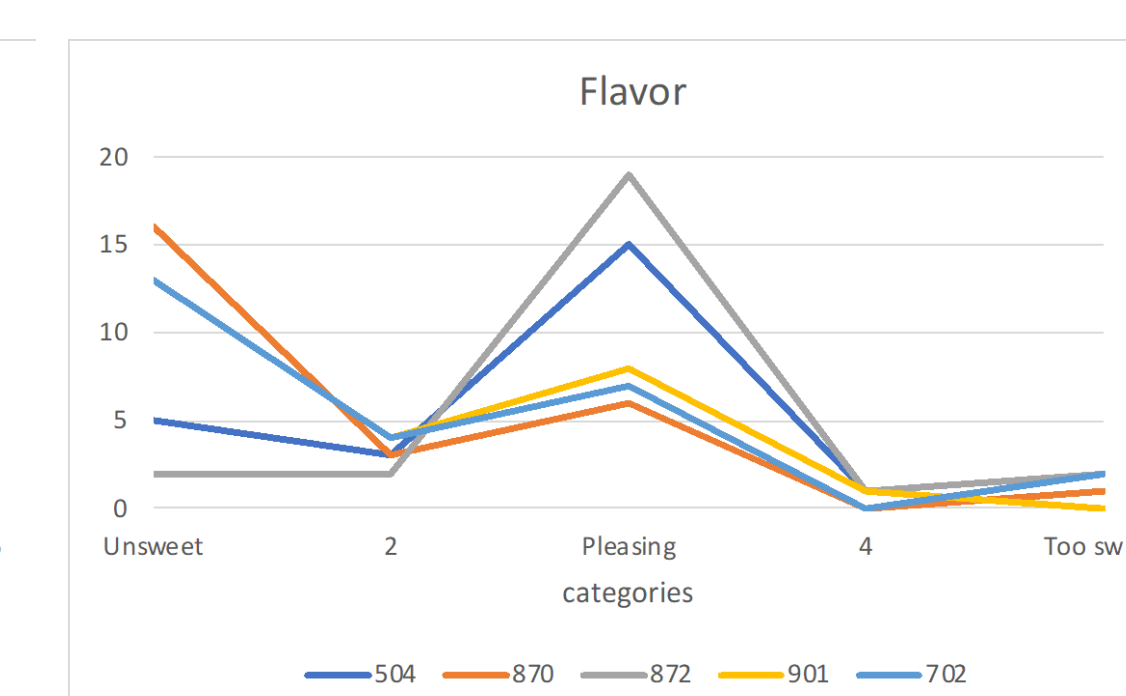

Figure 4. Overall texture category.

Figure 5. Overall flavor category.

Nutrient Analysis

The main purpose of this study was to determine different option for fat substitution. Table 3 provides a comparison of the total fat, cholesterol, saturated fats monosaturated fats, polysaturated fats, and overall calories. Using Nutritionist Pro ® to analyze the macronutrients, the avocado variable contained the most kilocalories (581), yet the olive oil variable had the highest total fat content (12.0 g) in addition, it had the highest monosaturated fats (8.3 g) and polysaturated fat (1.3 g) content. The control contained the highest cholesterol content (61.6 mg) alongside with saturated fats (6.22 g).

The variable with overall low levels of fat intake was applesauce which contains a total of 130 calories, 1.3 g of total fat, 37.2 mg of cholesterol, .48 g of saturated fats, .46 g of monosaturated fats, and .20 g of polysaturated fats. The avocado, applesauce, and olive oil variable all had the same cholesterol levels of 37.2 mg. See Figure 6 and 7.

Table 3. Nutrient analysis for the different variables.

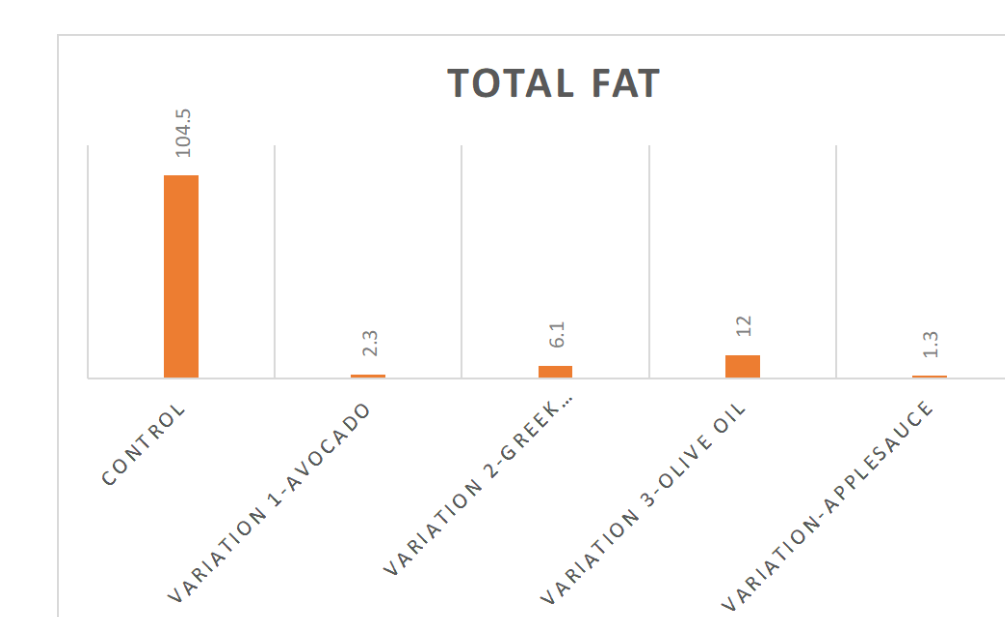| Variation	Kcal	Total Fat	Cholesterol	Saturated Fat	Monosaturated Fat	Polysaturated Fat
Control-Butter	208	10.5g	61.6mg	6.22g	3.1g	.54g
Variation 1-Avocado	581	2.3g	37.2mg	.64g	1.2g	.33g
Variation 2-Greek Yogurt	175	6.1g	51.2mmg	3.5g	1.8g	.37g
Variation 3-Olive Oil	223	12.0g	37.2mg	1.9g	8.3g	1.3g
Variation-Applesauce	130	1.3g	37.2mg	.48g	.46g	.20g

Figure 6 . Total fat intake for each variation.
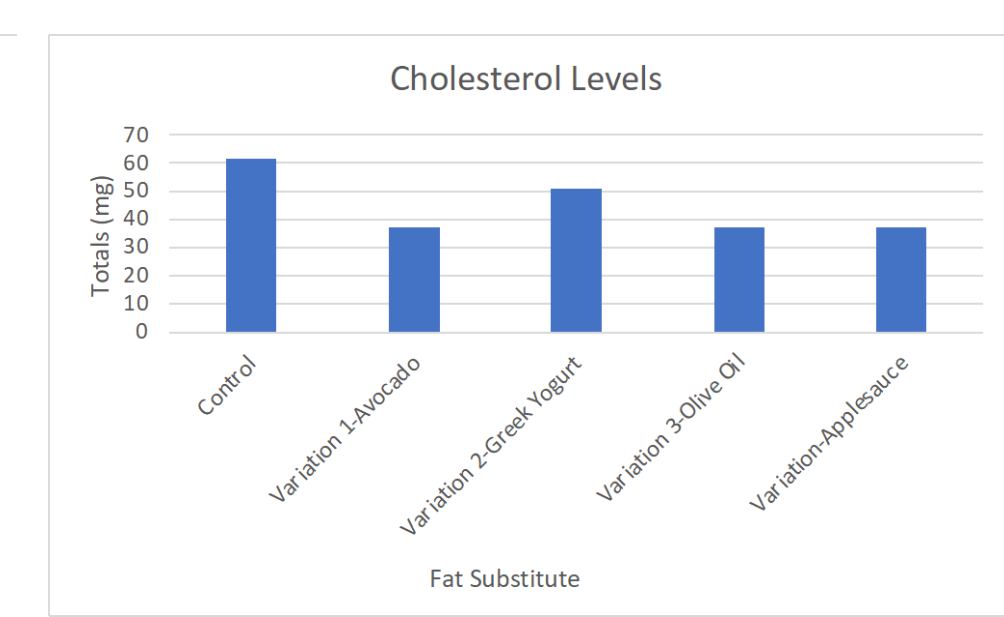
Figure 7 Cholesterol levels for each variation.

Conclusion

The butter control had the best overall results. Due to the similarity structure, olive oil came in second place. Regarding the nutrient analysis the variables with the less cholesterol and saturated fats content applesauce which can be a great substitute for butter. All the fat substitutes used in this research are good substitutes for butter due to its low saturated fats and cholesterol.

References

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2. Centers for Disease Control and Prevention, National Center for Health Statistics. *About Multiple Cause of Death*, 1999–2019. CDC WONDER Online Database website. Atlanta, GA: Centers for Disease Control and Prevention; 2019. Accessed April 16, 2022.