

# DEVELOPMENT AND ANALYSIS OF SHORTBREAD COOKIES USING MASHED BANANA AS A FAT REPLACER

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**Abstract:** This present study was performed to study the physical, nutritional and sensory characteristics of cookies using mashed banana as fat replacer in the shortbread cookies. Mashed banana was used to substitute the butter in cookies to reduce the fat content and increase its nutritive profile. The aim of this study is to determine the effects of mashed banana on physical properties, proximate composition and sensory characteristics when it is replaced by the butter as fat source. The Variations are formulated by 25%, 50% replacing the butter with mashed banana. The results that are obtained from the sensory analysis shows that 25% have better acceptability of 4.04% over the 50% substitution of butter with mashed banana which had 3.4% of overall acceptability replacement of butter. The incorporation of the mashed banana also has an effect on the moisture content and ash content of the shortbread cookies. Overall fat percentage has also been decreased with the replacement of the butter with mashed bananas.

**Keywords:** Shortbread cookies, Butter, Fat replacer, Mashed banana.

## I. INTRODUCTION

One of the common baked cookies include Shortbread Cookies, this cookie is also known as shortie and it is a traditional Scottish biscuit usually made from one-part white sugar, two parts butter, and three parts plain wheat flour, which is a denser, crumblier cookie and are often described as 'short' due to their high ratio of butter to flour which results in a rich, melt-in-the-mouth consistency. Fat has been one of the most crucial ingredients in bakery items, affecting quality characteristics including colour, taste, texture, and aroma of bakery products, which have a significant effect on customer acceptability. Although the nutritional benefits of fats are well known, it is also associated with some health problems like obesity, cardiovascular and coronary heart diseases. (M.H., 2012). The banana being the lipid source for fat replacer, due to the inulin content in the banana which has the binding properties similar to the butter which can make the cookies less fat and have a less nutrient rich. So, the end product changes are the Physical properties. The decrease in cell density, aW, volume, increase in breaking strength, dough consistency, moisture, crumb density, firmness, springiness, cohesiveness. (Kathryn Colla, 2018). So, the cookies are made with flour, sugar and butter. In the variation the butter is replaced with mashed banana with 25% and 50%.

## II. MATERIALS AND METHODS

The study was conducted in MOP Vaishnav college for women in the Food Preparation Lab and evaluation was done in the Food chemistry lab. Raw materials for cookies preparation (White wheat flour, Butter, Baking powder, Powdered sugar, salt, Vanilla Essence) were procured from the local market. Bananas in the mature stage of ripening were procured from the fruit market. All reagents and chemicals, equipment used are from the Food chemistry lab. All the analyses were carried out in three replications.

### 2.1. PREPARATION OF COOKIES

Cookies were prepared by the modified recipe from the standard method described for the shortbread cookies. The variations in the formulations are shown below in the Table.1. For preparation of control cookies, butter and powdered

sugar were creamed using a beater for 2 minutes, and all other ingredients were added and mixed manually to get cookie dough. The dough was then sheeted to a thickness of 4mm and was cut using a dough cutter. For variations in the shortbread cookies, mashed bananas were added in different proportions such as 25% and 50% were added before creaming the butter.

SAMPLE	CONTROL	VARIATION 1	VARIATION 2
Flour	120g	120g	120g
Butter	80g	60g	40g
Mashed Banana	0g	20g	40g
Sugar	40g	40g	40g

Table 1: Ingredients for the cookie formulation in grams



Fig 1: Formulation of shortbread cookies using mashed banana

**2.2. PROXIMATE ANALYSIS AND SENSORY ANALYSIS OF COOKIES**

Moisture, Ash, Fat, Protein, Phosphorus content was evaluated by AOAC method. The sensory attributes (Appearance, taste, aroma, texture, overall acceptability) of the cookies were evaluated by 20 panellists who were asked to rate each sensory attribute. The coded cookie samples were prepared and served for evaluation based on hedonic scale (5- very good, 4- good, 3-fair, 2-average, 1- poor).

**III. RESULTS AND DISCUSSION**

**3.1. PROXIMATE ANALYSIS OF THE COOKIES**

TEST	CONTROL	VARIATION 1	VARIATION 2
Moisture (%)	8.82	8.21	9.75
Ash (%)	1.62	1.82	1.98
Fat (%)	31	28	23
Protein (%)	6.68	5.94	6.46
Phosphorus(mg)	14	17	22

Table 3: Proximate analysis of the cookies

The moisture content in the sample in sample C, with substitution of mashed banana as fat replacer in 50% and this has significant difference as compared to the sample B. As the increase in moisture content in the mashed banana has

significantly increased the moisture content of the cookies. Sample C has the highest ash content of 1.92% and sample A(control) has 1.62% had also mentioned that most of the bananas had relatively high amounts of potassium and magnesium. The ash content of the studied bananas ranged from 0.66 to 1.45 g/100 g. The protein content in the different cookie samples. Sample C had the highest protein content which is similar to control and sample B has the least amount of protein content of 59.4%. (Abimbola K. Arise, 2021) the protein content of the cookies has greatly been affected by the incorporation of mashed banana. The sample B have 25% about 5.94% of protein content and sample C which substituted with 50% of mashed banana as replacement of butter and have protein content of 6.46% of protein content.

The results obtained from the evaluation of the cookie samples (M.H., 2012).Banana puree has effect on physical, sensory quality of the cookies, and banana puree can be used as fat replacer as it has simultaneous effect on reducing the fat content of the cookies when used in the replacement of butter. It Is incorporated with 50% of mashed banana and this has a positive effect on decreasing the fat content of the cookies. The Control has less amount of minerals as the minerals present in the control is made of only butter and wheat flour, the mineral content present in them is seen in the control cookie. But the other two variations of the cookies are made up of different proportions of butter, mashed banana and wheat flour (Barnabas Oluwatomide Oyeyinka, 2019)Mashed banana contains various minerals and varies with different species, the addition of this mashed banana can increase the amounts of mineral content in the cookies. The amount of mashed banana added in sample B has 25% and has a gradual increase in the increase in phosphorus content and sample C has 50% of mashed banana and due to high amount of replacement of butter with mashed banana, sample C has higher phosphorus content when compared to other variations.

### 3.2. SENSORY EVALUATION

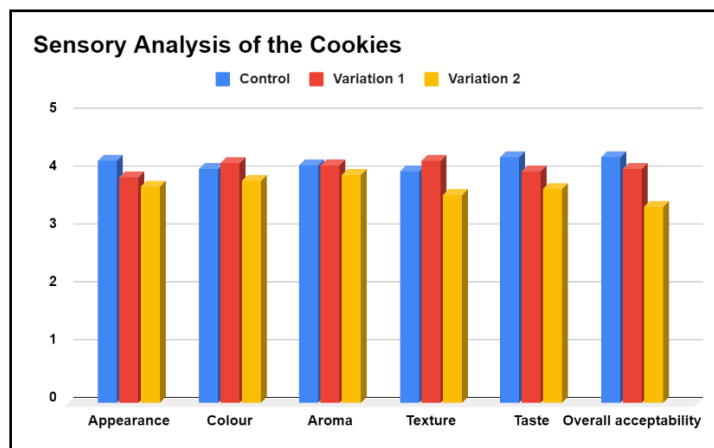


Fig 2: Sensory evaluation of shortbread cookies

The results of the hedonic scale test of all the different cookies are presented in the graphical representation is presented below. As the result shown in chart 5, colour, texture, flavour and aroma and overall acceptability. Sample C has a lower score in the sensory analysis, as result of increasing the amount of mashed banana about 50% in the cookies and out of five percent, sample C has a score of 3.4%. Sample B, 25% of mashed banana content have 4.05% of overall acceptability. Hence the 25% of mashed banana replaced by the butter is more acceptable by the panellists. The appearance and taste of the cookies shows similar results, as the amount of mashed banana is added the appearance and the taste of the cookies are gradually change and the colour of Sample B has more acceptability than sample C and the aroma of all cookies seems to be similar and have no significant changes due to the addition of mashed banana in the cookies. The texture of the cookies has greatly been affected by the addition of the mashed banana incorporated, more the addition of the mashed banana in the cookie, the texture has been changed and the acceptability of the cookies also have reduced when compared to the Sample A (control).

### IV. CONCLUSION

In the conclusion of this study, the effect using mashed banana as fat replacer in the shortbread cookies in two variations to evaluate their physical properties, nutritive values and their sensory characteristics. That mashed banana can be used as a good fat replacer in the cookie formulation. The both variations are more or less similar in appearance and taste and there are changes in the texture of the cookies. The Sample B (variation 1) has similar sensory characteristics of the cookies to the Sample A (control) but with increase in mineral content and reduced fat content.

The Sample C (variation 2) when compared to the Sample A and Sample B, the cookies are turned out to be less accepted due to the sensory characteristics but have increased in the mineral content and fat content has been reduced significantly. When both the variations are compared, mashed banana which can be replaced as 25% as the fat replacer is better than the 50%. Protein of cookies with 25% mashed banana to be of highest quality. The phosphorus content of the mashed banana in the cookies has the higher content in the variation 2 than the control cookies. Products low in moisture, such as cookies, remain difficult to prepare without fat, which is very important for tenderness and mechanical handling. It has been a better replacement for the cookie at 25% of the fat content and was in acceptable limits.

#### REFERENCES

- [1]. Colla, K., Cosanzo, A., & Gamlath, S. (2018). Fat replacers in baked food products. *Foods (Basel, Switzerland)*, 7(12), 192.
- [2]. Demirkesen, I., Lee, S., & Mert, B. (2023, May 6). Baked Products. *Fat Mimetics for Food Applications*, 392–418.
- [3]. Sanchez, C., Klopfenstein, C. F., & Walker, C. E. (n.d.). Use of carbohydrate-based fat substitutes and emulsifying agents in reduced-fat shortbread cookies' 72(1) 25-29.
- [4]. Dotto, J., Matemu, A. O., & Ndakidemi, P. A. (2019). Nutrient composition and selected physicochemical properties of fifteen Mchare cooking bananas: A study conducted in northern Tanzania. *Scientific African*, 6, e00150.
- [5]. Arise, A. K., Akeem, S. A., Olagunju, O. F., Opaleke, O. D., & Adeyemi, D. T. (2021). Development and Quality Evaluation of Wheat Cookies Enriched with Bambara Groundnut Protein Isolate alone or in Combination with Ripe Banana Mash. *Applied Food Research*, 1(1), 100003.
- [6]. Abd-El-Khalek, M. (12 2012). Use of Response Surface Methodology to Optimize the Quality of Reduced-Fat Biscuits Containing Banana Puree as a Fat Replacer. *Alexandria Journal of Food Science and Technology*, 9.
- [7]. Oyeyinka, B. O., & Afolayan, A. J. (2019). Comparative Evaluation of the Nutritive, Mineral, and Antinutritive Composition of *Musa sinensis* L. (Banana) and *Musa paradisiaca* L. (Plantain) Fruit Compartments. *Plants (Basel, Switzerland)*, 8(12), 598.