

# Development, Sensory and Analytical Study of Spicy Banana Muffins

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**Abstract:** *The present work deals with the study of formulation, development and analytical study which includes the nutritional, physiochemical and sensory properties of spicy banana muffins. Various trials were taken for standardizing the formulation. Muffins were prepared with different concentration of cocoa powder, spices, mashed banana and other basic ingredients required for producing muffins. Sensory evaluation was conducted and the overall acceptability for sample gaining highest sensory scores was selected for further production and chemical analysis. The chemical composition of muffins of fresh sample was analyzed and it was found that it contains carbohydrates 52.5, protein 4.99, fat 14.5, sugar 20.9 and energy value 360 kcal/100gm.*

**Keywords:** Formulation, muffins, standardizing, nutrition.

## 1. Introduction

Bakery products constitute one of the most consumed foods in the world. Among them, cakes are popular and are associated in the consumer's mind with a delicious sponge product with desired organoleptic characteristics [1]. Cake batter is a complex emulsion and foam system. Flour, milk, fat, sugar, eggs and the leavening agent are the main ingredients used in its elaboration; each ingredient has an important function in the cake structure. [2].

Banana is a giant perennial herbaceous monocotyledons propagated vegetative crop. Belonging to the family *musaceae*, botanical name *Musaacuminata*, Genus *musa*. It is one of the important tropical fruit crops in the world and major tropical food crop. It comes fourth after grapes citrus and apples in world production and second after citrus in world trade [3]. Banana are one of the few fruits that ulcers patient can safely consume. Bananas neutralize the acidity of gastric juices, thereby reducing ulcer irritation by coating the lining of the stomach. Not only bananas relive painful ulcer systems and other intestinal disorders, they can also promote healing. Antifungal and antibiotic principles are found in the peel and pulp of fully ripe banana [4]. Banana is rich source of energy since it contains sugars such as fructose, glucose and sucrose. It is also rich source of iron which is helpful in stimulating production of blood haemoglobin and so it helpful in preventing Anaemia. Banana fruit is extremely high in potassium and low in salt, making it perfect food for helping to beat blood pressure. It maintains electrolyte balance of the body because of its contents of potassium. Eating of banana reduces the risk of strokes by 40%. Banana is rich in Fibre (pectin) it relives constipation, Diarrhoea, and other intestinal disorders. It also content an amino acid tryptophan which is converted into serotonin so acts as a mood enhancer [5].

Cocoa Powder has been found to improve antioxidant status, reduce inflammation and correlate with reduced heart disease risk; with these results, and its popularity, it has received wide coverage in the press [6].

Cardamom seeds have pleasant aroma and a characteristics pungent taste. They are used as a spice and in medicine. They are the common ingredient of curry powder, cakes and other bakery products and sweet breads. They are also used for flavouring liquors [7].

Literature review on cinnamon revealed that it mainly contains essential oils and important compounds like Cinnamaldehyde, eugenol, cinnamic acid and cinnamate. It has got good anti-inflammatory, anti-oxidant, anti-ulcer, anti-microbial, anti-diabetic, memory enhancer and many other activities [8]. Cinnamon is a spice that has ancient origins and is popularly used as flavourings, as a condiment and in cooking. Cinnamon is also known to provide various medicinal benefits that include lowering of blood cholesterol, for diabetes. Cinnamon is obtained from the bark of the Cinnamon tree. Cinnamon contains polyphenols, which are natural antioxidants that help in regulating Blood sugar levels. Certain compounds present in cinnamon stimulate the insulin receptors and thus help the body to use up glucose in the right way. Studies have shown that cinnamon can prove beneficial for those who suffer from diabetes, especially type 2 diabetes. Cinnamon improves insulin resistance that helps in weight control. This explains the use of cinnamon for weight loss. Using it regularly will reduce indigestion, constipation, and intestinal disorders. The concentration of protein in cinnamon is relatively low, as compared to that of calcium, iron, and dietary fibre content. Serving 6.8 g of the same will provide you 0.3 g proteins. Needless to say, you get proteins from other food ingredients. So, It's not at all a concerning issue. It's good source of calcium and iron; having 1 tablespoon of cinnamon is sufficient to yield 14 % calcium and 31 % iron of the daily requirements of an adult. Nevertheless, the requirements may vary slightly as per your calorie needs. It also contains high amounts of vitamin A and C along with minerals like Zn, K, Mg, and Mn. A 6.8 g serving provides 20 % vitamin A and 12 % vitamin C of the daily requirements of an adult [9].

Milk is a complex physiological liquid that simultaneously provides nutrients and bioactive components that facilitate

the successful postnatal adaptation of the new-born infant by stimulating cellular growth and digestive maturation, the establishment of symbiotic micro flora, and the development of gut-associated lymphoid tissues. The number, the potency, and the importance of bioactive compounds in milk and especially in fermented milk products are probably greater than previously thought. They include certain vitamins, specific proteins, bioactive peptides, oligosaccharides, organic (including fatty) acids. Some of them are normal milk components, others emerge during digestive or fermentation processes. Fermented dairy products and probiotic bacteria decrease the absorption of cholesterol. Whey proteins, medium-chain fatty acids and in particular calcium and other minerals may contribute to the beneficial effect of dairy food on body fat and body mass. There has been growing evidence of the role that dairy proteins play in the regulation of satiety, food intake and obesity-related metabolic disorders. Milk proteins, peptides, probiotic lactic acid bacteria, calcium and other minerals can significantly reduce blood pressure. Milk fat contains a number of components having functional properties. Sphingolipids and their active metabolites may exert antimicrobial Effects either directly or upon digestion [10]. In the present study muffins were prepared by using the different combinations of mashed banana, spices and cocoa powder. Three samples were prepared in that one sample was control and didn't contain mashed banana, spices and cocoa powder. In other two samples prepared, mashed banana, spices and cocoa powder were added up to the level of 7%&10%, 0.5%&1% and 4% & 5% respectively.

## 2. Materials and Methods

### 2.1 Procurement of Raw Material

Basic ingredient such as all-purpose flour, butter, sugar, spices, bananas and cocoa powder was purchased for preparations of muffins from local market.

### 2.2 Processing of Raw Material

The dry materials like refined wheat flour, sugar, cardamom powder, cinnamon powder, cocoa powder and leavening agents were sieved to remove unwanted material or impurities. The banana fruit is hand peeled and pulp were mashed by stainless steel masher. Raw cow milk was heated at the pasteurization temperature by the method of HTST 72 °C (161 °F) for 15 seconds.

### 2.3 Preparation of muffins

Muffins were prepared by taking appropriate proportions of ingredients with following sequence. The good quality raw material was selected i.e. it was free from foreign particles and microbial load after that refined wheat flour and sugar was sieved for proper dough mixing and achieving proper smooth consistency. Then, one large mixing bowl was taken and in that equal proportion (1:1) of sugar and butter was added & mix it well. After that dry mix (refined flour, spices, leavening agents & cocoa powder) and wet ingredients (milk and mashed banana) with its appropriate proportions was taken and added these ingredients simultaneously into mixing bowl with proper mixing in fixed direction

(clockwise or anticlockwise). After that kneading was done to attain the desired dropping consistency. The vanilla essence was added, and then the batter was poured into muffins moulds (cupcakes). And finally the muffins were baked in baking oven (which was preheated) at 110°C for 30 to 40 minutes or until gets golden brown colour. After cooling the muffins were weighed and packed in plastic bags and stored in air tight plastic container at ambient room temp.

**Table 1:** Standardized procedure for spicy banana muffins for 1 kg

Sr.No.	Ingredients	Quantity (gm.)
1	Sugar	140
2	Butter	140
3	Refined flour	240
4	Cocoa powder	50
5	Milk	250
6	Mashed banana	100
7	Cinnamon powder	10
8	Cardamom powder	10
9	Baking powder	10
10	Baking soda	05
11	Chocó chips	50

### Product output 32 muffins medium sized

#### 2.4 Various Formulation for development of muffins:

There were three formulations were made in order to standardize the Formulation of recipe for muffins to check the overall acceptability through sensory evaluation.

V1) Muffins made with the incorporation of mashed banana and spices.

V2) Muffins made with basic ingredient with no incorporation of banana and Other Material.

V3) Muffins made with incorporation of Mashed banana, spices, Cocoa powder.

**Table 2:** Formulation for 1 Kg production

Ingredients (g)	Formulations		
	V1	V2	V3
*M.B.	70	Nil	100
*CI.and CR.(1:1)	5	Nil	10
*C.P.	40	Nil	50
*R.W.F.	260	300	250

\*M.B.-Mashed Banana, \*CI.-Cinnamon,

\*CR. - Cardamom, C.P. - Cocoa Powder,

\* R.W.F. - Refined Wheat Flour.

#### 2.5 Chemical Analysis

Estimation of moisture content by hot air oven method was done at 110°C for 4 hrs. [9]. Total ash content was estimated by using muffle furnace method up to constant weight by igniting sample in a muffle furnace at 550±/ 250 °C For 4 hrs. [10]. For fat estimation the sample is extracted in a soxhlet apparatus for 7-8 hrs. Using petroleum ether. The solvent is evaporated and the residue is weighted [10]. The estimation of nitrogen was done by kjeldhal method whereas the protein content is obtained by multiplying the nitrogen value with 6.25 [10].

### 2.6 Sensory Analysis of Spicy Banana Muffins

The sensory analysis was conducted for acceptability of spicy banana muffins. The spicy banana muffins was prepared with incorporation of mashed banana, cocoa powder and spices in proportion with 10%, 5% and 1% respectively. It was shown to be more acceptable whereas increased amount of cocoa powder above 5 % shown less acceptable because of darker color and bitter taste was found. Incorporation of mashed banana with 10 % was standardized because above 10 % of mashed banana lead to lumps formation and also showing lower textural properties. The present study also standardized the spicy banana muffins formulation.

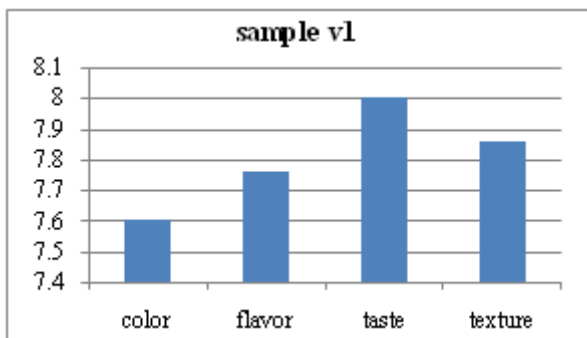
## 3. Results and Discussion

### 3.1 Sensory evaluation of spicy banana muffins

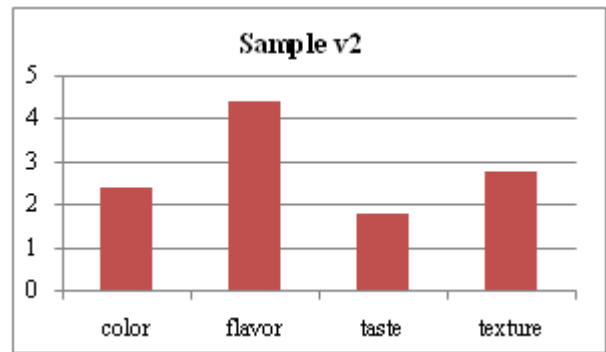
The results were obtained from sensory evaluation of spicy banana muffins with incorporation of cocoa powder was influenced by different concentration of spices, mashed banana and cocoa powder. The data on colour reveals that significantly higher scores for colour was recorded V3 sample in which cocoa powder was incorporated at 5 %.while, in respect with texture sample V1 got higher scores where mashed banana was incorporated at the rate of 7%. As on increase in the percentage of mashed banana affects the textural properties of final product i.e. forms lumps in muffins which was seen to be unacceptable. Significantly higher scores for taste was recorded in sample V3 .which was specially prepared by incorporation of mashed banana, Spices and cocoa powder at the rate of 10% ,1% and 5% respectively.

### 3.1 Chemical analysis of spicy banana muffins

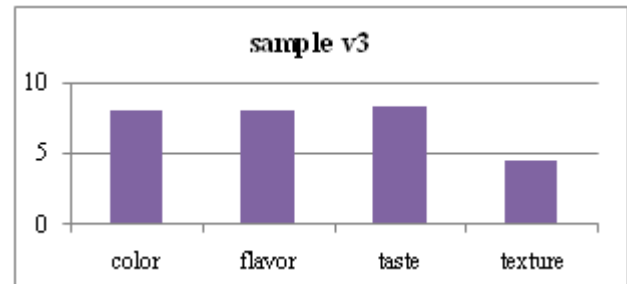
Chemical analysis of spicy banana muffins was conducted of sample which is more acceptable in sensory evaluation i.e. V3. It shown that addition of mashed banana above 10% will leads to increase in moisture content of product. Product with increased amount of flour, cocoa powder, Choco chips and banana was given higher amount of carbohydrates and proteins. The higher amount of mashed banana also increase amount of dietary fibers. With the addition of increased amount of above all ingredients lead in variation in ash and fats content of final product.



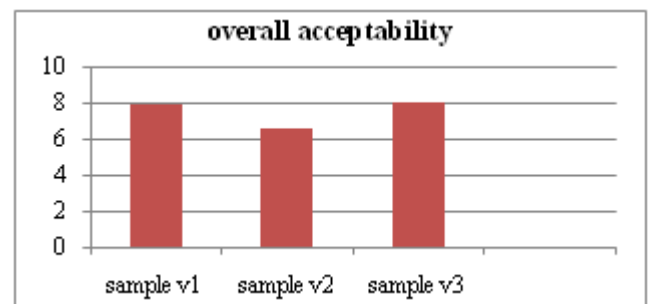
**Graph 2:** Sensory result of sample v1



**Graph 3:** Sensory result of sample v2



**Graph 4:** Sensory result of sample v3



**Graph 1:** Overall acceptability of product

**Table 3:** Chemical composition of muffins

Sr. no.	Parameter	Results	Unit
1	Energy value	360	Kcal/100 gm.
2	Protein	4.99	g/100 gm.
3	Carbohydrates	52.5	g/100 gm.
4	Sugar	20.9	g/100 gm.
5	Fat	14.5	g/100 gm.
6	Ash	1.5	%
8	Dietary fibre	1.7	%

**Table 4:** Overall Acceptability

Attributes	Sample V1	Sample V2	Sample V3
Colour	7.6	6.62	8
Flavour	7.76	6.45	8.08
Taste	8	6.79	8.37
Texture	8.12	6.62	7.625
Over- all Acceptability	7.86	6.62	8.01

## 4. Conclusion

Incorporation of mashed banana, cocoa powder, spices in refined wheat flour with appropriate proportions will lead to increase in overall acceptability of final product. Colour characteristics of muffins were affected by increased addition of cocoa powder. Banana pulp and spices are good source of energy, dietary fibres, potassium, amino acids,

various vitamins and minerals which imparts special health benefits. It was found that cinnamon in product act as an antimicrobial agent which were increased the shelf life of muffins up to 15 days without addition of synthetic preservative in product.

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