



# SENSORY EVALUATION OF HIGH PROTEIN AND LOW CALORIE COOKIES DEVELOPED FROM DEFATTED SOY FLOUR

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## Abstract

Cookies are a popular confectionary product with a unique texture and taste, long shelf life and a relatively cheap price. Therefore it is a widespread snack among people of all generations. However, cookies are usually made with wheat flour, and most formulations are high in calories and low in fiber. Soy flour is considered as an excellent addition to wheat flour because it is an excellent source of proteins, fiber, vitamins and minerals and increases the nutritional properties of the final product. The high protein, low calorie cookies were prepared using traditional creaming methods, using 0, 30, 50 % defatted soy flour, and sucralose as sugar substitutes. The prepared cookies were evaluated by 25 consumers on the basis of their appearance, taste, smell, texture and overall acceptability using a 9 point hedonic scale, which indicates that the cookies were acceptable.

**Keywords:** Defatted soy flour, High Protein, Low calorie, Sensory evaluation.

## Introduction

Soyabean (glycine max) is an important oilseed crop in India, along with groundnut and Indian mustard.<sup>1</sup> Soyabean have great potential to provide quality protein at a low cost. Soyabeans contains twice as much protein as other legumes, peanuts, meat and fish. Soy protein is unique among plant proteins due to its relatively high biological value and presence of essential lysine, a limiting amino acid found in most grains. Soyabeans are also called lean meat because they have about 1% and a high protein content (53-55%). Soy protein is called a complete protein because it provides a variety of amino acids needed for bodybuilding and tissue repair. Soy protein is nutritionally equivalent to animal proteins from eggs, milk, fish and beef.

Cookies have become one of the most popular snacks among young and old due to their low cost of production, more practical, long shelf life and ability to serve as a means for important nutrients.<sup>2</sup> Consumption of baked goods increase due to urbanization and increase the number of working women. Biscuits are not considered a staple food like bread but can be viable fibre carriers because of their longer shelf life and thus allowing their dissemination on a large-scale production and distribution.

Cookies usually refer to baked goods consisting of three main ingredients flour, sugar and butter. It is mixed with other fine ingredients to form a dough. Due to its valuable rheological properties, wheat is mainly used in bakery products. Wheat flour is major structural component of many doughs and dough products.<sup>3</sup> Its gluten content allows it to perform this textural function, which allows air cells to expand and provide firmness after cooking.

However, wheat proteins lack some essential amino acids and have less protein compared to oilseeds and legumes. Complex flour technology, which supplements wheat with protein-rich ingredients such as oilseeds and legumes, may be a way to overcome malnutrition. Therefore, supplementing wheat flour with high-quality soy protein can improve the nutritional quality of mixture.<sup>4</sup> In addition, to increase the utilization of soyabean in people's daily diet, it is urgently necessary to develop new soybean foods with high added value. Replacing sugar with sucralose also helps health-conscious populations consume cookies. The current study envision the development of high-protein, low-calorie cookies using defatted soy flour and saccharin.

The high fat content of soyabean meal limits protein and amino acid extraction, promotes oxidation reactions that induce acidity, and produces off-flavours with volatile compounds that may be unacceptable to consumers and shortens shelf-life. The material left after removing oil from soybeans is called defatted soyabean meal, which can be used to produce high-protein, low-fat foods and may be a promising resource in the future.<sup>5</sup> When used in food production, DSF possess several attractive functional properties such as solubility, water and oil absorption, emulsification, swelling, gelling and foaming properties. Defatted soybean meal is a more renewable and economical source than soy protein isolate or soy protein concentrate and it contains soy protein, soy carbohydrate and soy whey.

Sucralose is sold as Splenda. What makes Splenda different from other sweeteners like aspartame and saccharine is that it is actually made from sugar.<sup>6</sup> They generally taste better than other artificial sweeteners. Sucralose is 600 times sweeter than real sugar and contains almost no calories. Because it does not leave taste in the mouth, it is used in foods such as yogurt, candy, cookies, ice cream, and soda. Sucralose can be especially beneficial for diabetics who need to control their sugar intake. It sweetens foods and drinks, but does not raise blood sugar as much as regular sugar.

Today's consumers are increasingly health-conscious and demand healthy foods such as low-calorie, low-sugar, high-protein, and high-fiber foods. Consumers are also looking for natural products. Low-calorie products can be developed by adding fillers with high moisture absorption to reduce calorie by one-third.<sup>7</sup> Lifestyle changes can increase the symptoms of diseases such as high blood pressure, diabetes, cardiovascular disease and other similar disease. In addition, population growth due to depletion of food resources is a major concern as it leads to malnutrition. They need a sugar-free, high-protein, low-calorie diet and can be prepared by adding a low-calorie, high-protein, high-fiber diet to their diet.<sup>8</sup>

## Material and methods

### Preparation of Raw Materials

#### Sprouting

The soybeans are grown before they are made into flour. This includes cleaning the seed thoroughly to remove dust, dirt, chaff and debris. The seeds were soaked in distilled water at room temperature for 4 h. then the excess water was removed, the sample were further rinsed with distilled water and again soaked in water for 4 h, after that the seeds and cotyledons were used for the next process and the husks were removed.

#### Defatting of soy flour

In order to increase the protein concentration of soy flour, the oil was extracted by defatting. The oil was taken from soy powder with the help of organic solvents. I abandoned the soy and put it in the ether for 12-16 h. after the extraction was completed, the supernatant containing the oil was removed from the flour. After air-drying under a fume hood overnight to remove residual solvent from the defatted flour, it was dried in an oven at 45 degree Celsius for 2 h until the smell of hexane was undetectable. The samples were then stored in airtight glass container at 4 degree Celsius until further use.

The raw materials such as wheat flour, sucralose, baking powder, butter, toned milk, etc were purchased from local market.

## Formulations of cookies

Table 1. below shows the different combinations of flour samples

Formulation	Defatted soy flour	Wheat flour
T0	0%	100%
T1	30%	70%
T2	50%	50%

To each of the formulation, following ingredients was added:

50 g of butter

10 g of sucralose

¼ teaspoon baking powder

¼ teaspoon salt

Cookies were prepared by replacing wheat flour with 0, 20, 30 % defatted soy flour, and the levels were standardized by sensory evaluation.

### Steps of cookies preparation

#### 1. Cream butter and sucralose powder

Mix the butter and sucralose. In a large bowl, beat the butter and sucralose on high speed until fluffy.

- It takes about 5 minutes
- Make sure the butter is soft before mixing it with the sugar.
- A hand mixer with a paddle attachment works well. But a standard mixer attachment can also be used.

#### 2. Add the dry ingredients

Now, in a separate bowl, add measured amount of the wheat flour, defatted soy flour, baking powder, and salt. Beat them together. You can also use a sifter if you want.

#### 3. Finish the dough

Next, add the ingredients to the butter mixture and beat with a hand mixer until well combined.

- Use a low speed to prevent the flour from flying while mixing.
- Mix just until the flour has been incorporated. Do not mix too much.
- When the mixer slows down and starts to struggle, mix in the rest of the flour with a mixing spoon.
- Divide the dough into 2 to 4 parts. Each part should be about the same size. wrap the dough in plastic wrap. Wrap each piece of dough in plastic wrap. Flatten the dough into a disk before fully rolling it out. Refrigerate the dough for 2 h before baking.

#### 4. Bake those cookies

Now you can take the dough with a spoon and place it on a baking tray or tray lined with baking paper. Bake in the oven for 15-20 minutes. The time will depend on the size of the cookies you are making and how soft you want them to be. When it comes out of the oven, let it cool on a baking sheet for about 5 minutes, then transfer it to a wire rack to cool completely.

## 5. Serve those cookies

Look how nice and light golden brown the cookies are on the bottom. Time to serve them up. If you underbake them just a bit they will continue to cook a little bit while on the pan and produce a softer cookie. Or just bake them a bit longer for a nice crunchy cookie.

### Consumer acceptability and sensory evaluation

A hedonic scale used for sensory evaluation of product and consumer perception developed as a possible descriptive acceptance testing method that includes a 9- hedonic scale.

The 9-points hedonic scale reflects and describes consumer perceptions and satisfaction. This study was conducted on approximately 25 students studying at our university. Consumer were required to rate the prepared cookie based on taste, aroma, color and appearance. They received the hedonic scorecards indicated in the table.

Rating scale/Hedonic scale	Score
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5
Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

## Result and discussion

25 people from our university were selected for sensory evaluation and presented with soy flour cookie sample. Sample were distributed to people and sensory evaluation for taste, smell, taste, shape and texture were done.

**Table 1. sensory score of cookie formulation on the basis of overall acceptance**

panellist	Appearance/colour	Taste/ flavour	Smell/ odour	Texture/ mouth feel
P1	8	7	8	8
P2	9	9	9	9
P3	8	7	8	7
P4	9	8	9	9
P5	7	7	8	8
P6	9	9	8	9
P7	9	8	6	8
P8	7	8	9	6
P9	9	9	8	9
P10	8	9	7	7
P11	9	8	9	8
P12	9	9	8	6
P13	8	6	7	9
P14	9	8	9	7
P15	8	7	9	8
P16	7	9	6	8
P17	9	9	8	7
P18	7	7	8	9
P19	8	9	7	8
P20	7	8	8	6
P21	9	7	9	8

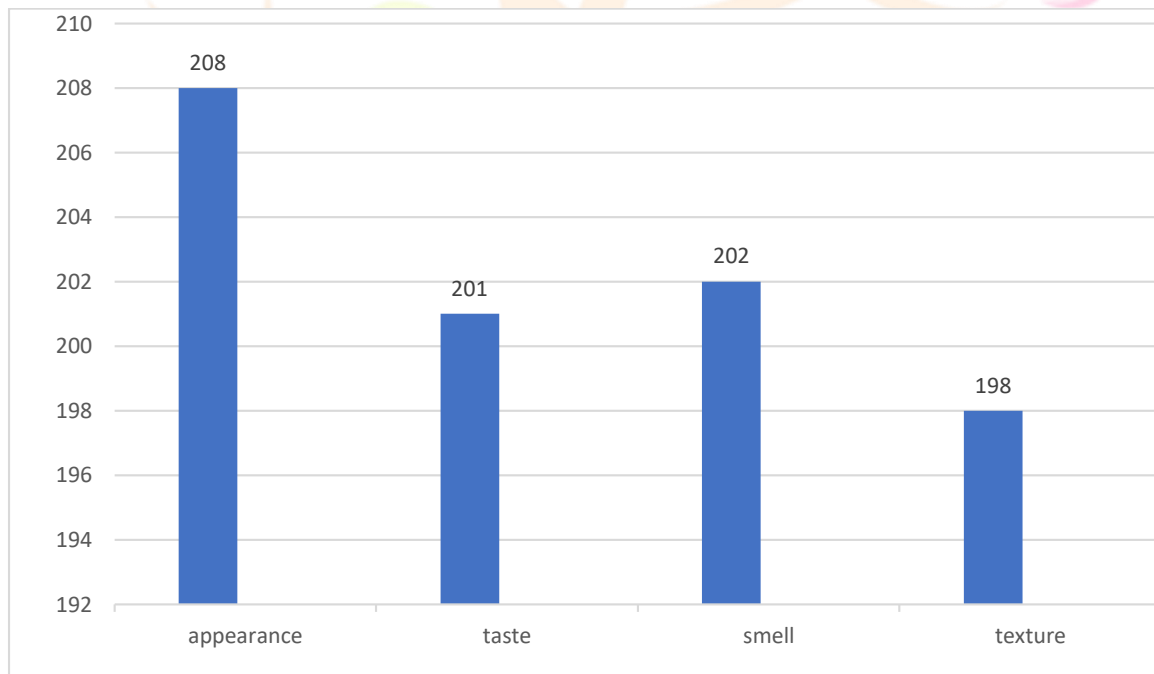
P22	9	9	9	9
P23	8	7	8	9
P24	9	8	9	7
P25	9	9	8	9
Total	208	201	202	198
Mean	8.32	8.04	8.08	7.92
Standard deviation	0.802	0.954	0.886	1.243

### Overall observation

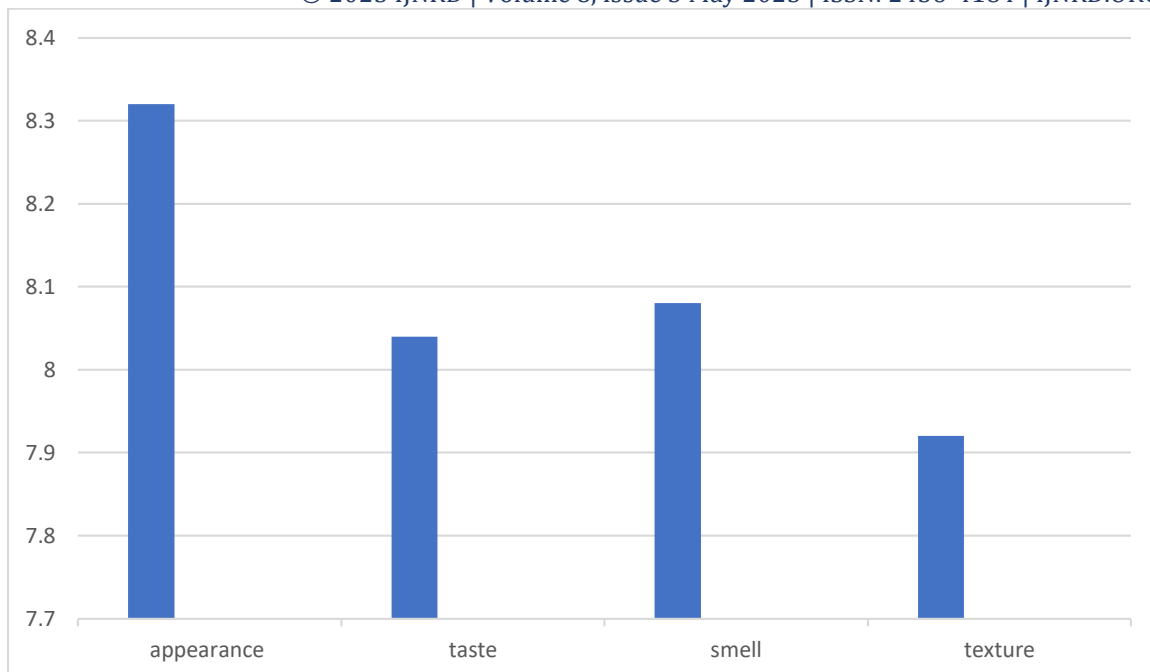
The parameter on the basis of which the overall acceptance of the cookie was examined are taste, appearance, texture and smell. The calculated total, standard deviation and mean is shown in the above table. The developed product was tested on several parameters and it was found that the appearance of cookie was most accepted amongst all the parameter.

**Table 2. Mean scores of the five sensory attributes of the cookie formulation**

Attributes	sample
Appearance	8.32
Taste	8.04
Smell	8.08
Texture	7.92



**Graph 1. Graphical representation of overall acceptance**



**Graph 2. Graphical representation of the mean sensory score of cookie formulation**

## Conclusion

Consumer acceptance of products developed from wheat flour, defatted soy flour, sucralose, baking powder, salt and cashew was tested by professors and residents of the Babasaheb Bhimrao Ambedkar university using a 9-point hedonic scale. The prepared samples were tested on a total of 25 consumers and were evaluated for appearance, taste, smell and overall acceptability of which appearance of cookies were liked by most of the consumers.

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