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Obtaining Halva from A Mixture of Sunflower Seeds and Ground Sunflower Meal

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Abstract

The article explores the production and quality evaluation of halva made from sunflower seed kernels and sunflower seed meal. Various formulations were tested to determine the optimal composition based on organoleptic, nutritional, and physicochemical indicators. The results showed that halva prepared from sunflower seed kernels exhibited the best quality characteristics, including balanced sweetness, oiliness, and texture. In contrast, samples made with sunflower meal or a 50/50 mixture had a darker color and lower fat content, reducing their market appeal. The analysis of vitamin and mineral content revealed that sunflower kernel halva contained higher levels of calcium and zinc, enhancing its biological value. Overall, the optimal formulation contained 45 g of sunflower kernels, 25 g of sugar, 15 g of water, one egg, and 4 g of sesame seeds, providing a product with high nutritional and sensory quality.

Keywords: Halva, sunflower seed, walnut, sesame, sugar, biological value, flaxseed.

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1. Introduction

The development of the food industry contributes not only to the economic growth of a country but also to the diversification of food products. However, it is essential not only to increase the quantity of food products but also to ensure their nutritional value and safety. In the 21st century, food products must not only satisfy consumers from various social groups but also be rich in essential vitamins, macro- and micronutrients [1–4].

Halva is an ancient sweet with a long history, and various descriptions exist regarding its origin. Despite numerous changes over the centuries in the methods of preparation and the ingredients used in its recipe, halva has not lost its significance.

Historically, halva is believed to have originated in the Near East, although some sources suggest it may have first appeared in India. Sources dating back to the 12th century contain information about halva, indicating that it was made from seeds and nuts. It is also noted that in ancient Egypt, halva was prepared using honey and dates as the main ingredients [4–6].

The ingredients used to make halva vary depending on the region in which it is produced. For example, in India, halva is made from various nuts and seeds; in Arab countries, it is prepared using sesame seeds; and in Russia, sunflower seeds are commonly used. Each country introduces changes to halva production technology and recipes based on its cultural traditions, and these variations are passed down from generation to generation.

2. Materials and Methods

There are several types of halva, including:

Sesame halva – one of the most widespread varieties, made by grinding roasted sesame seeds. It has a sweet, nutty flavor.

Peanut halva – made from peanut paste, with a rich and slightly salty taste that enhances its flavor.

Milk halva – typically prepared using milk or condensed cream, and various fruits or nuts may be added. The taste varies accordingly.

"Sooji" halva – made primarily from semolina, usually with sugar, ghee (clarified butter), and various spices added.

There is a wide variety of halva types to choose from depending on the preferences of gourmets. The process of making halva is complex and requires specific technology and several stages. The main stages of halva preparation include the following:

Stage 1 – one of the most crucial steps in halva production – is the preparation of seeds and nuts. The use of the following key ingredients is involved:

Sesame seeds. Before use, they are roasted to enhance their flavor and aroma. During the roasting process, the natural oils are released, which increases the richness and quality of the halva.

Peanuts. These are also roasted to improve their flavor. The roasting can be done either with whole peanuts or in the form of a paste, depending on the desired texture and taste.

Walnuts, almonds, as well as sunflower seeds, pumpkin seeds, and other types of seeds and nuts can also be used. Each of these ingredients requires specific processing and preparation steps before being incorporated into the halva-making process.

Stage 2 involves the addition of sugar and other ingredients to the halva.

Sugar is the primary ingredient responsible for the sweet taste of halva. It dissolves easily in a small amount of water and fat, forming a syrup that is essential in halva production.

Flavorings or aromatic additives such as vanilla, cardamom, and cinnamon are widely used in halva making. These ingredients give the halva its distinctive flavor and aroma.

Oil – sometimes sunflower oil or ghee (clarified butter) is added to the halva. This improves the consistency and enhances the overall taste of the final product.

Once the above ingredients are added, they must be thoroughly mixed until a uniform mass is achieved.

Stage 3 involves packaging and storage of the halva.

Shaping and cutting – the halva is molded into the desired shape and size using appropriate molds.

Packaging – to extend shelf life and ensure usability, the halva is packed using various materials such as polyethylene, cardboard, or other suitable packaging types.

Marketing and distribution – after packaging, the halva is sent to retail outlets or directly to consumers.

In addition, the inclusion of powdered milk, cocoa powder, dried fruits, and candied fruits further enhances the nutritional value of halva. The energy value of 100 grams of halva is approximately 510–550 kcal. Its biological composition typically includes 10–20% protein, 30–35% fat, and 28–35% sugar.

The following sequence of operations was carried out in laboratory conditions for the preparation of halva.

In the Republic, halva is primarily produced using

sunflower seeds. For this reason, sunflower seed kernels were selected as the base ingredient. The dehulled sunflower kernels were roasted at 110–120 °C, during which moisture reduction, protein coagulation, and protein denaturation were observed. The raw materials were brought to a specific moisture level: sesame seeds – 1.2%, sunflower kernels – 1.0%, and nuts – up to 2%.

To prepare the sugar syrup (caramel mass):

One egg white is mixed with 2.5 grams of powdered sugar and 2.5 grams of table salt, and whipped until a firm foam is formed.

Separately, 25 grams of sugar and 15 grams of water are combined and boiled until a syrup-like consistency is achieved. Once cooled, the syrup is added to the whipped egg white.

The roasted sample was mixed thoroughly with the syrup in various proportions, and 5 grams of sesame seeds were added on top. The mixture was then set in molds to solidify.

3. Results and Discussion

In the first formulation, sunflower seed kernels were used directly for halva preparation [7,8].

Table 1. Formulation and quality indicators of halva produced from sunflower seed kernels

№	Sunf- lower Kernels, g	Sugar, g	Water, g	Egg, pcs	Pow- dered Sugar, g	Salt, g	Sesame, g	Quality Indicator
1.	35	25	15	1	2,5	2,5	4	Sweeter, less oily
2.	40	25	15	1	2,5	2,5	4	Adequately sweet, but less sticky
3.	45	25	15	1	2,5	2,5	4	Good sweetness and stickiness, sufficient oiliness
4.	50	25	15	1	2,5	2,5	4	Oilier, moderate sweetness
5.	55	25	15	1	2,5	2,5	4	Excessively oily, low sweetness

As can be seen from the table above, Sample 3 demonstrated the best results in terms of organoleptic and quality indicators. This confirms that the chosen formulation was optimal under the given conditions. Sesame seeds were added to the formulation with the aim of increasing the biological value of the product. Sesame seeds contain approximately 60% oil, 27% protein, and 20% arbohydrates. In addition, they are rich in vitamins B1, B2, B3, B6, and folic acid, as well as essential minerals such as calcium, iron, magnesium, and others. Incorporating up to 4% sesame seeds into the formulation not only improves the quality characteristics of the halva but also significantly enhances its nutritional and biological value.

A) B)

Figure 1. Images of Halva Prepared from Sunflower Seed Kernels.

In the second formulation, halva was prepared similarly to the first formulation, but using sunflower seed meal (press cake)—that is, the crushed residue of sunflower seeds after oil extraction.

Table 2. Formulation and quality indicators of halva made from sunflower seed meal

№	Sunflower Seed Meal, g	Sugar, g	Water, g	Egg, pcs	Powdered Sugar, g	Salt, g	Sesame, g	Quality Indicator
1.	35	25	15	1	2,5	2,5	25	Sweeter syrup content, lower stickiness, and darker color
2.	35	25	15	1	2,5	2,5	25	Lower syrup content, better stickiness
3.	45	25	15	1	2,5	2,5	4	Lower syrup content, darker color, good stickiness, and low fat content
4.	50	25	15	1	2,5	2,5	4	Moderate fat and syrup content, but darker color
5.	55	25	15	1	2,5	2,5	4	Moderate fat content, low

								syrup content, and darker color

As shown in Table 2, the quality indicators of the halva change with the increase in the amount of sunflower seed meal. When the meal content reached 50%, the halva demonstrated sufficient fat and syrup levels, but the color became noticeably darker.

A) **B)**

Figure 2. Images of halva made from sunflower seed meal.

The initially dark color of the sunflower seed meal influenced the final appearance of the halva. Since the oil had been extracted, the resulting halva was drier and its fat content was insufficient.

In the next stage, halva was prepared by mixing sunflower seed kernels and sunflower meal in various proportions (see Table 3).

Table 3. Formulation and Quality Indicators of Halva Made from a Combination of Sunflower Seed Kernels and Meal

№	Sunflower Kernels and Meal, g (50/50)	Sugar, g	Water, g	Egg, pcs	Powdered Sugar, g	Salt, g	Sesame, g	Quality Indicator
1.	35	25	15	1	2,5	2,5	4	Higher syrup content, lower stickiness, darker color
2.	40	25	15	1	2,5	2,5	4	Lower syrup content, better stickiness
3.	45	25	15	1	2,5	2,5	4	Adequate syrup content, darker color, good

								stickiness and fat content
4.	50	25	15	1	2,5	2,5	4	Moderate fat and syrup content, but darker color
5.	55	25	15	1	2,5	2,5	4	Moderate fat content, low syrup content, and darker color

The quality indicators of this sample are similar to those of the second formulation; however, the darker color negatively affects its marketability. Therefore, it was observed that even a 50/50 ratio of sunflower seed meal in the formulation can reduce the commercial appeal of the halva. This can also be seen in Figure 3

Figure 3. Images of halva made from sunflower seed kernels and meal

Halva contains almost no fat-soluble vitamins; it only includes some water-soluble vitamins, namely vitamin C, B1, B2, B3, B5, B6, B9, and B12.

Table 4. Vitamin composition of halva samples with different formulations

Vitamin Content, mg	**Daily Dose per 100g Product**	**Based on Recipe 1**	**Based on Recipe 21**	**Based on Recipe 3**
C, мг	100	0,2	0,1	0,18
B1, mg	1,1	0,5	0,4	0,48
B2, mg	1,4	0,2	0,1	0,17
B3, mg	16,2	3,0	2,8	2,4
B5, mg	0,2	0,3	0,2	0,17
B6, mg	1,1	0,3	0,2	0,28
B9, mkg	398,7	67,0	65,0	67,0

As can be seen from the table above, the amount of vitamins present in the halva is significantly below the recommended daily intake, making it essential to enrich the product with various biologically active compounds. Some vitamins do not even reach 98% of the daily required dose.

In addition, the mineral composition of halva was studied, and the following results were obtained (Table 5).

Table 5. Mineral Composition of Halva

Mineral Content	Daily Dose per 100g Product	Based on Recipe 1	Based on Recipe 21	Based on Recipe 3
Calcium mg	1000	350,0	320,0	340,0
Iron mg	9,9	4,8	3,8	4,2
Magnesium mg	400	220,0	202,0	210,0
Phosphorus mg	700	600,0	580,0	580,0
Potassium mg	4675	190,0	170,0	184,0
Sodium mg	1300	192,0	162,0	181,0
Zinc mg	10,9	4,4	3,8	4,2
Copper mg	0,89	1,4	1,0	1,1
Manganese mg	2,3	1,0	0,7	0,9
Selenium mg	55,02	12,0	10,0	11,2

As seen from the table above, some minerals exceed the recommended daily intake, while others are present in insufficient amounts. However, among the tested formulations, the most optimal results were obtained from Recipe 1.

In general, halva poses little to no harm, but due to its high fat content and caloric value, it is recommended to consume 20–30 grams, two to three times per week.

4. Conclusion

In conclusion, halva made from sunflower seed kernels showed better results in terms of commercial and quality indicators compared to halva made from a 50/50 mixture of kernels and meal, or from meal alone. The higher calcium and zinc content in its composition also indicates an increase in its biological value.

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