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Investigation of physicochemical and sensory properties of low-calorie chocolate dairy dessert containing konjac gum and sorbitol

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ABSTRACT

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In this research, sugar alcohol Sorbitol was used as a substitute for Sucrose and Konjac gum was used as a carbohydrate-based fat mimic in the preparation of chocolate dairy dessert samples and then their effect on some physicochemical properties and total calories and some sensory properties and overall acceptance were studied. Statistical evaluation was performed using anova and duncan's multi-range test or 5% error probability level with SPSS software. pH content of the samples containing Sorbitol and Konjac gum showed a significant increase compared to the control sample, the acidity and protein content of the samples in comparison with the control sample showed a significant increase and the amount of fat, total sugar and total calories of the samples showed a significant decrease compared to the control sample. It was also found that most of the samples containing Sorbitol and Konjac gum scored higher compared to the control sample in the evaluation of sensory characteristics. Finally, treatment number 3 which has 10.6% Sorbitol and 0.5% Konjac gum introduced as a superior treatment.

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1- Introduction

Dairy desserts (excluding cultured products and ice cream) encompass a diverse range of consumer products that contain significant amounts of dairy products (milk solids) [1]. Dairy products represent a large market, generating more than \$125 billion per year worldwide [2]. Milk-based products play an important role in maintaining the daily human diet as they are a major source of calcium, vitamin D, phosphorus, potassium, manganese, riboflavin, and niacin [3]. With the popularity of dairy products, new consumer demands have emerged for healthier, lower-calorie products that taste similar to their higher-calorie counterparts [2]. Consumer demand for healthier products has led to a strong push to reduce sugar in dairy foods. Sugar plays an important role in dairy foods, not only in flavor, but also in texture, color, and viscosity. Substituting sugar can have negative effects and make substitution inherently difficult [2]. Functional product development offers an opportunity to help improve food quality and consumer health and well-being [4]. The food industry has responded to public demand by producing a number of low-calorie products under the name of sugar alcohols as sweeteners. Sorbitol, which has the systematic name diglucitol, is a 6-carbon sugar alcohol that was discovered by a French chemist in mountain berries in 1872. Sorbitol provides fewer calories than sugars and is approximately 60% sweeter than sucrose. Due to its non-pathogenic properties, it is used in products for specific nutritional purposes, such as those intended for people with type 2 diabetes [5]. In general, excessive fat consumption can lead to cardiovascular diseases, obesity, etc [6]. The past two decades have witnessed an increasing interest in developing low-fat and

fat-free products in response to increasing consumer demand. The formulation of such products is faced with the problem that fat plays multiple roles in food and affects appearance, texture, mouthfeel, and flavor [7]. Fat substitutes are compounds that differ in physical and chemical structure from fat and are able to simulate the role of fat at very low concentrations. Many low-fat products produced in recent years contain carbohydrate-based fat substitutes. One of these substitutes is gums and hydrocolloids [8]. Hydrocolloids are widely used in food for gelling, texture modification, and stabilization purposes [9]. Konjac glucomannan has long been used as an ingredient and additive for noodles, jellies, and snacks in East Asia [10]. This gum is extracted from the tubers of the *Amorphophallus konjac* plant of the Araceae family. This neutral polysaccharide is used as a gelling agent and thickening agent in traditional Asian foods due to its high water-absorbing capacity. In addition, it is considered one of the most viscous dietary fibers [11]. Currently, only konjac glucomannan, obtained from the *Amorphophallus konjac* plant, has been widely studied and consumed among the sources of glucomannan. Evidence of the beneficial functional, nutritional, and physiological properties of konjac glucomannan has been recognized in recent years [12].

Foods with low sugar and fat content are usually less acceptable, and one of the reasons for the decrease in acceptability is the decrease in organoleptic properties. Therefore, efforts to discover substances that can partially fulfill the role of sugars and fats have increased. Considering the above-mentioned information, it is necessary to conduct research that reduces the harms of sugar and

fat consumption, with the aim of preserving physicochemical and organoleptic properties. Therefore, the aim of the aforementioned research is to produce a dairy dessert with desirable characteristics and health-promoting properties, and for this reason, sorbitol sweetener and konjac gum were used.

Mohammadi et al. (2019) studied the effect of konjac gum, homogenization pressure, and fat content on the rheological properties of low-fat cream. Based on the results, it was determined that konjac gum, as a hydrocolloid that has high nutritional value, can be used as a suitable substitute for fat in cream and create desirable rheological properties in it [13]. Also, Najaf Najafi and Hakaran (2021) studied the effect of konjac and marjoram gums and the effect of homogenization speed and fat on the pH, texture, and color of low-fat stirred yogurt. Based on the results, konjac and marjoram gums, in addition to having a synergistic effect on some characteristics of low-fat yogurt, as hydrocolloids that themselves have high nutritional value, can be used as suitable fat substitutes in low-fat yogurt and create desirable rheological properties in it [14]. Jerangi et al. (2022) also studied the effect of adding konjac gum as a fat substitute on the rheological and sensory properties of low-fat mayonnaise and found that konjac gum consistently improved the stability index of low-fat mayonnaise, and the acceptability of the texture and consistency of low-fat mayonnaise increased with increasing konjac gum concentration, which in turn improved the overall acceptance of the resulting product [8]. In another study, Hosseini-pour et al. (۲۰۲۳) studied the optimization of sensory characteristics and rheological properties of low-calorie dairy dessert containing sucralose-sorbitol sweetener using the d-optimal mixed design

method. According to the results, the composition of the sugar substitute sweetener in the optimized formulation was obtained to include 2.9% sucrose, 3.9% fructose, and 5.81% sucralose-sorbitol. Also, in the study of rheological characteristics, the highest viscosity and the highest degree of pseudoplasticity were related to the optimized sample. In addition, the results of shear-oscillating flow tests indicated a strong gel structure of the produced dessert sample [15].

Goff et al. (1984) showed in their study that the use of aspartame-polydextrose and aspartame-sorbitol sweeteners can have a significant effect on the sweetness intensity of dairy desserts. With increasing aspartame content, sweetness increased, and with increasing polydextrose and decreasing sorbitol, sweetness decreased [16]. Morais et al. (2014) in their study developed a chocolate dairy dessert by adding prebiotics and replacing sucrose with different high-intensity sweeteners. The results showed that the addition of prebiotics and gums to chocolate dairy desserts affected their acceptability. Neotame was also the strongest sweetener and stevia the weakest sweetener [4]. Laura et al. (2017) also showed in their studies that dairy dessert formulations with sugar-free and reduced fat content, sweetened with stevia and sucralose, and using inulin as a fat substitute, can be prepared with pleasant sensory and physical properties for the consumer [17]. And also Ewis (2021) was successful in preparing a low-calorie functional yogurt drink enriched with oat grains and stevia leaf powder (as sweeteners) and concluded that the use of oats and stevia increased the antioxidant properties of yogurt during storage [18].

2 - Materials and methods

2-1 Raw materials

In the aforementioned research, raw materials including brand-name sugar (Katherine), brand-name sterilized low-fat milk (Domino), brand-name sterilized low-fat cream (Pegah), nonfat dry milk powder (Golshad), cocoa

powder with 10-12% fat (Cargill Gerkens), sorbitol (from Taraneh Confectionery Supplies), and konjac gum (from Adonis Daru Company) were prepared and purchased.

Table 1. Formulation of the treatments used in the present study

Raw materials and Treatment	Sugar	Sorbitol	Konjac Gum	Non-fat dry milk powder	Cocoa powder with 10-12% fat	Low-fat sterilized cream	Low-fat sterilized milk
Control	30	-	-	36	13.5	75	145.5
Treatment 1	24	12	0.9	36	13.5	60	153.6
Treatment 2	12	24	1.2	36	13.5	45	168.3
Treatment 3	8	32	1.5	36	13.5	30	179
Treatment 4	-	40	1.8	36	13.5	-	207.8

All the treatments in the present study are 100 grams.

2.2- Production of chocolate dairy dessert

To produce chocolate dairy dessert, the method of Seyed Mahmoud Zadeh and Ahmadi Dastgerdi (2012) was used [19]. The solid raw materials were combined in a completely dry container. Sterilized low-fat cream and sterilized low-fat milk were mixed

together, then the solid materials were sieved and added, and during this time the mixture was stirred continuously and gently. The dessert was placed in sterile glass containers in the refrigerator at 4°C. The addition amounts of sorbitol and konjac gum were selected as optimal levels based on the results of the pre-test.

Table 2. Treatments used in the present study

Treatment	Sorbitol (%)	Kongac Gum (%)
Control	0	0
Treatment 1	4	0.3
Treatment 2	8	0.4
Treatment 3	10.6	0.5
Treatment 4	13.3	0.6

2.3- Chemical tests

2.3.1- pH measurement

pH measurement was performed according to Iranian National Standard No. 2852 using a desktop pH meter (HANNA, Italy) [20].

2.3.2- Measuring acidity

Acidity measurement was performed according to the Iranian National Standard No. 2852 using 0.1 normal sodium hydroxide (caustic soda) and phenolphthalein by titration method [20].

2.3.3- Protein measurement

Protein measurement was performed according to Iranian National Standard No. 639 using a 12-well Kjeldahl protein digestion and distillation apparatus (GERHARD, Germany) [21].

2.3.4- Fat measurement

Fat measurement was performed according to Iranian National Standard No. 384 using a butyrometer (fat meter) and a Gerber centrifuge (FUNKE GERBER, Germany) [22].

2.3.5- Measurement of total sugar

Total sugar was measured according to Iranian National Standard No. 2450 and by Fehling's method [23].

2.4- Measuring total calories

Total energy content (in calories) was calculated based on the following equation:

$$K = (F_p \times P) + (F_l \times L) + (F_c \times C)$$

In this formula, K is the calorie, F is the constant factor for each compound (for protein (F_p): 4.27, for fat (F_l): 9.02, for carbohydrate (in terms of sugar) (F_c): 4.10, P is the amount of protein (grams per 100 grams of sample), L is the amount of fat (grams per 100 grams of sample), C is the amount of carbohydrate (in

terms of sugar) (grams per 100 grams of sample) [19].

2.5- Sensory evaluation

The sensory characteristics of the produced samples, including texture, color, taste, odor, mouthfeel, and overall acceptability, were evaluated using a 5-point hedonic method by 7 trained evaluators, and each characteristic in each sample was assigned a score of 1 to 5. In this way, score 5 = very good, score 4 = good, score 3 = average, score 2 = poor or unpleasant, and score 1 = very poor or very unpleasant [6].

2.6- Statistical analysis

The results of the experiments were analyzed in a completely randomized design with three replications. In order to statistically examine the obtained data, one-way analysis of variance was used, and Duncan's multiple range test was used to compare the mean data at a significance level of 5% to examine the significance of the results. Statistical analyses were performed using SPSS software [6].

The production method, as well as chemical tests and sensory evaluation, etc. used in this research were selected according to Iranian national standards and also by reviewing and paying attention to other reputable articles and research conducted in the field of dessert production and the use of sugar alcohols and hydrocolloids in food. Also, the amounts of materials used were selected according to the pre-test conducted.

3 – Results and Discussion

3.1- Physicochemical properties

Table 3. Effect of replacement with Sorbitol and Konjac Gum with Sucrose and Fat on the physicochemical properties of Dairy chocolate dessert.

Treatment	pH	Acidity	Protein	Fat	Total Sugar
Control	6/0±66/015 ^a	0/0±213/005 ^a	8/0±51/051 ^a	7/0±57/120 ^a	6/0±46/050 ^a
Treatment 1	6/0±75/010 ^b	0/0±193/005 ^c	8/0±36/051 ^b	7/0±07/056 ^b	6/0±23/045 ^b
Treatment 2	6/0±74/005 ^b	0/0±180/010 ^b	8/0±48/090 ^{ab}	6/0±04/107 ^c	4/0±27/047 ^c
Treatment 3	6/0±76/010 ^{bc}	0/0±193/005 ^c	4/0±54/051 ^a	4/0±60/270 ^d	3/0±96/088 ^d
Treatment 4	6/0±77/015 ^c	0/0±203/005 ^{ac}	8/0±75/090 ^c	2/0±14/055 ^e	2/0±91/015 ^e

Different letters are significantly different ($p < 0.05$).

3.1.1- pH level of chocolate dairy dessert

According to the results in Table 3, it was found that the addition of konjac gum and sorbitol significantly increased the pH of the dairy dessert samples compared to the control sample ($p < 0.05$). In other words, the addition of konjac gum and sorbitol was effective in increasing the pH of all treatments compared to the control sample. According to the Iranian National Standard No. 2852, the pH of dairy desserts should be between 6.3 and 6.8 [20]. And the pH of all treatments is within this range. Daghte and colleagues also presented in 1400 that the use of Qodomeh Shirazi gum as a carbohydrate-based fat mimic in low-fat cream was able to significantly increase the pH of the samples [6]. Treatment 4 had the highest pH, contained the highest amount of konjac gum and no cream in its formulation, and the control sample had the lowest pH, contained the highest amount of cream and no konjac gum in its formulation. Carbohydrates, compared to dairy products, increase the pH value in food products. As Ewis reported in 2021, the use of oat grains and stevia leaf powder in yogurt increased the pH value of the samples, and the reason for this was the increase in the amount of fiber in the formulation [18]. In this study, the reason for the increase in pH in the treatments compared to the control sample was the use of konjac gum, which is a hydrocolloid and carbohydrate-based fat substitute and also a

source of fiber that replaced cream as the source of fat in desserts. As a general rule, pH affects the quality of attractions and bonds between molecules and affects textural and rheological properties [15]. According to a report by Toliti et al. in 2013, increasing the amount of *Spirulina platensis* microalgae in a dairy dessert increased its pH. Also, Toliti et al. in 2013, citing Varga et al. in 2013, reported that adding *Spirulina* to fermented milk samples led to an increase in pH, and they attributed this to the alkaline nature of *Spirulina* [24]. Toker et al. also reported in 2013 that the use of alginate and xanthan gums can increase the pH in dairy desserts, and the reason for this was attributed to the molecular structure of the gums and their interaction with other ingredients [25]. Also, in 2019, Aafi et al. reported that using sorbitol instead of sucrose had no significant effect on the pH of the treatments in a study of the effect of replacing sucrose with sorbitol in strawberry marmalade samples [26]. Therefore, it can be concluded that the main reason for the increase in pH was the use of konjac gum, which is a hydrocolloid and a carbohydrate. It is worth noting that the use of sorbitol and konjac gum in excess of the tested amounts can lead to undesirable results in terms of increasing pH, exceeding the standard limit, and negatively affecting the texture and sensory properties of the product.

3-1-2- Acidity level of chocolate dairy dessert

According to the results in Table 3, it was determined that the addition of konjac gum and sorbitol first caused a decrease and then an increase in the acidity in the treatments ($p < 0.05$). In this regard, Moholi and Lashkari also presented in 2020 that replacing grape juice with sucrose in dairy dessert samples caused a significant increase in acidity [27]. Acidity is an essential indicator for determining the quality of dairy products and is related to the presence of natural organic acids [28]. The acidity of dairy products is affected by the balance between nitrogen compounds in the products resulting from proteolytic reactions and lactic acid resulting from the fermentation activity of lactic acid bacteria [27]. In this regard, Ewis presented in 2021 that the use of oat grains and stevia leaf powder in yogurt increased the acidity of the samples, and the reason for this was reported to be the increase in the amount of fiber in the formulation [18]. As in the present study, konjac gum acts as a source of fiber. In another study, Ahmadian et al. reported in 1402 that by adding *Spirulina* algae to dairy dessert samples, the activity of proteolytic microorganisms that entered the dessert from raw materials and milk initially dominated the activity of lactic acid bacteria, but over time, with the increase in lactic acid bacteria, lactic acid production became dominant and acidity increased [29]. In another study, Hosseiny and Sedaghati in 2023 concluded that the acidity of the treatments increased significantly compared to the control sample ($p < 0.05$) [28]. Zare and Lashkari reported in 2021 that adding grape juice concentrate to dairy desserts increased the acidity of the treatments [30]. Also, Dakhte et al. reported in 2014 that the acidity of low-fat breakfast cream samples increased significantly with the addition and increase of Persian gum. The reason for

observing these results was attributed to the acidity of Persian gum with an average pH of 4.4 [6]. In the present study, sucrose as a source of glucose and cream as a source of lactose and protein were gradually eliminated, which meant a gradual and cross-sectional decrease in the amount of fermentation activity of lactic acid bacteria. Also, by further eliminating sucrose and cream, the amount of milk in the formulation gradually increased, which partially replaced cream as a source of lactose and protein, causing a gradual increase in the amount and fermentation activity of lactic acid bacteria. It should be noted that sorbitol, as a sugar alcohol, affects the sugar-acid balance, and konjac gum is a carbohydrate-based fat mimic and a source of fiber, and this could have gradually affected the acidity of the product and increased it. It is important to note that using sorbitol and konjac gum in excess of the tested amounts can have adverse results in terms of increasing the acidity of the product and adversely affecting the taste, texture, and other sensory properties of the product.

3.1.3- Protein content of chocolate dairy dessert

According to the results in Table 3, it was determined that the use of konjac gum and sorbitol initially caused a decrease and then an increase in the protein content in the treatments ($p < 0.05$). The reason for the initial decrease and then an increase in the protein content in the treatments was the removal of cream and then the increase in the amount of milk in the formulation. Konjac gum is a polysaccharide, and its addition to the formulation cannot cause much change in the protein content [31]. However, due to its reducing compounds, it can help to inhibit free radicals and increase the number of amino

acids, thereby increasing the amount of protein in the product. On the other hand, sorbitol is also a sugar alcohol that is not subject to the Maillard reaction, as Faghihzadeh Gorji and Sharifi presented in 2019. The protein content of the treatments increased significantly with increasing the level of stevia used in the preparation of gelatin desserts. So that the highest amount of protein was seen in gelatin desserts produced with 500 ppm stevia and the lowest amount of protein was seen in the control sample (without stevia). The reason for this can be attributed to the presence of stevia, which was able to control the Maillard reaction in samples containing stevia. As a result, it increased the amino acids (free nitrogen) in the medium and therefore the amount of protein measured in the final samples increased [32]. Also, Ewis in 2021 presented that the protein content of the product can be increased by using oat grains and stevia leaf powder in yogurt [18]. Also, Toliti et al. in 2014, in studying the effect of adding spirulina microalgae to dairy desserts, concluded that the protein content in the treatments was directly affected by the amount of spirulina used and increased with the increase in the amount of spirulina, and this was related to the high protein content in spirulina (55 to 60 percent) [24]. The results obtained in the present study were also consistent with the results obtained by Miani Sarizadi et al. in 2016, who showed that the protein content of dairy dessert samples increased significantly with the addition of malt and gelatin. Also, at equal gelatin percentages, the protein content increased with the increase in the malt to starch ratio, which was reported to be due to the protein nature of gelatin [33]. It should be noted that using sorbitol and konjac gum in excess of the tested amounts can increase the

protein content in the product, but the product will not be desirable in terms of rheological and textural properties.

3.1.4- Fat content of chocolate dairy dessert

According to the results in Table 3, it was determined that the addition of konjac gum and sorbitol significantly reduced the fat content of the dairy dessert samples compared to the control sample ($p < 0.05$). The reason for the reduction in fat content in the treatments compared to the control sample was the use of konjac gum as a carbohydrate-based fat substitute, which increased from treatment 1 to treatment 4 in the formulation, respectively, and the removal of cream from the product formulation. Sorbitol is also a fat-free sugar alcohol that is easily combined with other ingredients in the formulation and affects the quality of the texture. Regarding fat reduction in dairy dessert, Sarizadi et al. presented in 2016 that adding gelatin (0 to 2%) to dairy dessert significantly reduced its fat content, which was attributed to a reduction in fat content based on dry weight [33]. In another study, Moholi and Lashkari presented in 2020 that replacing grape juice significantly reduced the fat content in dairy dessert samples, and they attributed the reason to a reduction in fat content based on dry weight because grape juice has very little fat [27]. Also, hydrocolloids, including konjac gum, have a very high ability to absorb water, which is one of the reasons for creating a high concentration and fatty state in the product, as Karbalai Amini et al. presented in 1400. By adding gum and balango to a milk dessert, the fat content of the samples was significantly reduced, and the reason for this was reported to be the ability of hydrocolloids to create a high-fat and oily state for a product whose fat content has been reduced. In fact,

hydrocolloids compensate for the low fat content by their ability to absorb and bind water and have texturing properties, and help create a jelly-like structure similar to fat [34]. Also, Zare and Lashkari reported in 2021 that by adding grape juice concentrate to dairy dessert, the fat content of the treatments changed from 80.23% to 0.27% [30]. It is important to note that using sorbitol and konjac gum in excess of the tested amounts can reduce the fat content in the product, but the product will not be desirable in terms of rheological and textural properties and in general sensory and will become too hard.

3.1.5- Total sugar content of chocolate dairy dessert

According to the results in Table 3, it was determined that the addition of konjac gum and sorbitol significantly reduced the sugar content of the dairy dessert samples compared to the control sample ($p < 0.05$). Sorbitol, as a sugar alcohol and sucrose substitute, can produce more sweetness than sucrose while having fewer calories. Also, the use of konjac gum as a fat mimic can affect and increase the sweetness content of sorbitol. Regarding the reduction of sugar and replacement of sucrose in dairy desserts, Moholi and Lashkari reported in 2020 that by adding grape juice to dairy dessert samples, the sucrose content in the samples was significantly reduced, so that all samples differed from each other, and in the control sample, which was the sweetener

consumed, the sugar content was the highest, and in treatments containing grape juice, the sugar content dropped sharply [27]. Also, Khoshri Rad and Goli reported in 2011 that when replacing sugar and almond kernels in the dietary lozenge formulation with acetoside-isomalt, the total sugar percentage of the optimal samples decreased significantly compared to the control sample, and the reason for this was reported to be the increase in the levels of sugar replacement with acetoside-isomalt in the optimal sample [35]. Also, the results obtained in the present study were consistent with the results obtained by Zabihi and Karajian in 1401, who showed that when millet flour was added as a substitute for rice flour to the formulation of dairy desserts, the sugar content was significantly reduced. The results showed that the control sample had the highest sugar content, and the sugar content was negligible in the samples containing millet flour. The reason for this was the lower approximate carbohydrate content of millet flour compared to rice flour [36]. It is worth noting that the use of sorbitol and konjac gum in excess of the tested amounts can reduce the sugar content in the product, but the product will not be desirable in terms of taste and will not be liked by everyone due to the dominance of the sorbitol taste, and flavoring should be used.

3.2- Total calorie content

Table 4. Effect of replacement with Sorbitol and Konjac Gum with Sucrose and Fat on the Total calories of Dairy chocolate dessert.

Treatment	Total calories
Control	12/29 ^a ±131/1
Treatment 1	07/41 ^b ±125/0
Treatment 2	24/44 ^c ±108/1
Treatment 3	20/71 ^d ±94/2
Treatment 4	63/78 ^e ±68/0

Different letters are significantly different ($p < 0.05$).

According to the results in Table 4, it was found that the addition of konjac gum and sorbitol significantly reduced the total calorie content of the dairy dessert samples compared to the control sample ($p < 0.05$). Konjac gum is a carbohydrate-based fat mimic that, as a substitute for cream as the main source of fat in dairy desserts, is able to create a fatty state in the product, even if used in a much smaller amount than cream. Konjac gum is a hydrocolloid with a very high ability to absorb water and create concentration in the product. As Seyed Mahmoudzadeh and Ahmadi Dastgerdi presented in 2020 regarding the use of fat substitutes, increasing the amount of inulin versus reducing the amount of fat reduces the amount of energy per serving of dessert [19]. Sorbitol, as an alcoholic sugar, is capable of producing many times more sweetness than sucrose in smaller amounts, but it has much fewer calories. As reported in 2019, regarding the use of sucrose substitutes, Faghihzadeh Gorji and Sharifi reported that gelatin dessert samples containing stevia had significantly fewer calories compared to the

control sample. The control sample had more calories due to its sugar content, and due to the low calorie content of natural stevia sugar, the total calorie content in the remaining samples was lower [32]. 2 kcal of energy is released per gram of sorbitol and about 4 kcal of energy is released per gram of sucrose. In this regard, Aafi et al. reported in 2019 that by replacing the sugar in strawberry marmalade with sorbitol at a probability level of 0.001, the total calorie content of the product was significantly reduced ($p < 0.001$) [26]. And in another study, Ewis presented in 2021 that by using stevia leaf powder as a substitute for sucrose in yogurt samples, the energy content of the samples was lower than the control sample (containing sucrose) [18]. As is clear, using sorbitol and konjac gum more than the tested amounts can reduce the calorie content of the product, but the product will not be desirable in terms of sensory properties such as texture and taste, etc.

3.3- Sensory characteristics

Table 5. Effect of replacement with Sorbitol and Konjac Gum with Sucrose and Fat on the Sensory characteristics of Dairy chocolate dessert.

Treatment	Texture	Color	Taste	Smell	Mouthfeel	General acceptance
Control	14/690 ^a ±2/0	57/975 ^a ±2/0	86/690 ^a ±2/0	57/786 ^a ±3/0	14/690 ^a ±3/0	71/755 ^a ±2/0
Treatment 1	57/13 ^a ±2/1	28/755 ^a ±3/0	00/816 ^a ±3/0	85/690 ^a ±2/0	00/816 ^a ±3/0	00/577 ^a ±3/0
Treatment 2	00/00 ^a ±3/1	14/21 ^a ±3/1	00/816 ^a ±3/0	00/15 ^a ±3/1	71/951 ^a ±2/0	00/15 ^a ±3/1
Treatment 3	25/707 ^b ±4/0	62/517 ^b ±4/0	75/462 ^b ±4/0	12/640 ^a ±4/0	50/534 ^b ±4/0	75/462 ^b ±4/0
Treatment 4	00/632 ^b ±4/0	33/816 ^b ±4/0	00/894 ^b ±4/0	50/04 ^a ±3/1	33/816 ^b ±4/0	16/752 ^b ±4/0

Different letters are significantly different ($p < 0.05$).

3-3-1- Chocolate Dairy Dessert Texture

According to the results in Table 5, it was found that the use of konjac gum and sorbitol significantly improved the texture of the treatments ($p < 0.05$). In other words, adding

konjac gum and sorbitol improved the texture of the chocolate dairy dessert, but increasing the amount of konjac gum would have the opposite effect. The reason for the improvement in texture in treatments

containing konjac gum and sorbitol is the use of konjac gum as a water-absorbing hydrocolloid that can play the role of cream fat and increase the concentration of the product. Thickening compounds are involved in reducing the spontaneous leakage of the formulation and can be used as a natural additive in the formulation of new dairy products with high nutritional value [37]. Reducing the amount of sucrose used can lead to a weakening of the texture and wateriness of the final product. The addition of hydrocolloids to dessert formulations can be effective in overcoming this deficiency due to their ability to form gels by binding with water, increasing viscosity even at low consumption concentrations, and emulsifying properties [38]. But using too much gum can make the product too stiff. In fact, increasing the amount of konjac gum to 0.6% increases the gummy state in the dairy dessert, and therefore more force is needed to overcome this state. Here, konjac gum as a thickening agent prevails over sorbitol as a texture softener. As Najaf Najafi et al. presented in 1400, by increasing the amount of konjac gum and marjoram seed gum to the same amount, the gummy state (the gummy state is defined as the force required to break up semi-solid food into a state ready for swallowing) of low-fat stirred yogurt samples increased, indicating a high synergistic effect of these two gums on the gummy state of the samples. In fact, it can be concluded that by increasing the cross-linking of proteins and strengthening the three-dimensional protein network and increasing hardness due to the addition of gums, the gummy state also increased and the force required to break up the yogurt texture increased [14]. In other words, with the increase of high molecular weight molecules (gum), the flow resistance increases and the

product becomes stiff[39]. Also, in another study, Jerangi et al. presented in 1400, with the increase in the amount of konjac gum in low-fat mayonnaise samples as a fat substitute, the texture score increased and the treatments had a significant difference with the control sample[8]. In 2019, Aafi et al. reported that, when replacing sugar with sorbitol in strawberry marmalade, rubability, consistency, and consequently sensory desirability decreased with increasing sorbitol in the treatments [28]. The results of the present study were also consistent with the results obtained by Dakhte et al. in 2011, who reported that increasing the amount of Shirazi and Persian gum in low-fat cream treatments significantly increased the texture score of the sample [7]. This shear-thinning behavior and, in fact, an increase in product viscosity could be related to the complex interaction between milk proteins and the hydrocolloid used, and with increasing hydrocolloid in the formulation, the texture of the product becomes firmer [39]. According to the results, using sorbitol and konjac gum in excess of the tested amounts can affect the stability of the product and reduce the amount of synergy. As shown by increasing the gum and sorbitol to the mentioned amounts compared to the control sample, a decrease in the amount of water loss was observed, but it can also make the product too hard, which is not sensory desirable.

3-3-2- Chocolate dairy dessert color

According to the results obtained from Table 5, it was found that the use of konjac gum and sorbitol significantly improved the color of the treatments ($p < 0.05$). Color is one of the appearance characteristics of food that affects the consumer's perception of the quality of the product and plays a significant role in the

consumer's acceptance of the product [39]. In fact, the color in food is affected by the natural colors present in the raw material or the color compounds produced during the process [26]. In this regard, in a study by Najaf Najafi and colleagues in 1400, adding konjac gum and marjoram seed gum to yogurt improved its color [16]. However, with increasing the amount of konjac gum, the result will be the opposite. Konjac gum is light yellow and sorbitol is light white. The reason for the improvement in color from treatment 1 to treatment 3, respectively, is the color-improving properties of konjac gum and sorbitol, which will improve the color by increasing their amount in the formulation. However, in treatment 4, the color evaluation score of the chocolate dairy dessert has a downward trend, which is due to the high use of konjac gum and the increased amount of milk in the formulation, and the new interactions of the gel network due to the addition of gum can lead to larger aggregations of casein micelles and reduced light scattering, resulting in a decrease in the brightness of the food product [16]. As Seyed Mahmoudzadeh and Ahmadi Dastgerdi presented in 2020, the transparency index decreased with increasing the amount of inulin in the formulation of a milk chocolate dessert [21]. Yousefzadeh and Taghizadeh presented in 2023 that adding tragacanth gum and wheat starch to a dairy dessert significantly reduced the whiteness score of the samples. They also reported, citing Razmkhah et al. in 2010, that increasing the concentration of hydrocolloid reduces the color score in the product [39]. Aafi et al. (2019) presented in a study of replacing sugar with sorbitol in strawberry marmalade that with increasing sorbitol in the treatments, the color intensity and, consequently, the sensory desirability

decreased [26]. Also, the results obtained in the present study were consistent with the results obtained by Dakhte et al. in 1400, who showed that the use of Persian gum in cream samples improved the color of the treatments compared to the control sample, but statistically there was no significant difference between them [6]. According to the results, the use of sorbitol and konjac gum in excess of the tested amounts can affect and reduce the color and transparency of the product, which is not desirable from a sensory perspective.

3-3-3- Chocolate dairy dessert flavor

According to the results obtained from Table 5, it was determined that the use of konjac gum and sorbitol significantly improved the taste in the chocolate dairy dessert treatments ($p < 0.05$). In other words, adding konjac gum and sorbitol improved the taste in the chocolate dairy dessert, but completely replacing konjac gum and sorbitol with cream and sucrose would have the opposite result. Taste perception is a combination of the two senses of smell and taste [39]. Romachik-Cerpovic et al. (2006) reported that replacing okra gum with milk fat in frozen chocolate dairy dessert samples improved the taste of the samples (above average), however, when the replacement of okra gum with milk fat reached 100%, the taste acceptance was significantly lower than the control sample [40]. Sorbitol makes the product sweet and konjac gum increases the effect of this taste, and as a fat substitute, it makes the product more palatable and improves the taste. As reported in relation to the use of fat mimics on taste, Pourshani et al. (1997) reported that increasing the amount of balango seed gum and whey protein in non-fat ice cream samples improved the taste of the samples [41]. However, excessive use of sorbitol can create a specific cooling sensation

in the mouth that is not desirable for everyone. Aafi et al. (2019) studied the replacement of sugar with sorbitol in strawberry marmalade and found that sensory scores decreased with increasing sorbitol, and treatments with higher sorbitol levels were less acceptable and had a different sweet taste than the control sample (containing sucrose) [26]. Also, the results obtained in the present study were consistent with the results obtained by Arabi et al. in 2019, who showed that increasing the concentration of gelatin and pectin in almond milk-based desserts improved the taste [42]. According to the results, using sorbitol and konjac gum in excess of the tested amounts can negatively affect the taste of the product due to the dominance of the specific taste of the alcoholic sweetener and gum, making it undesirable in terms of sensory properties, and in high amounts, even if a flavoring is used, the texture will become too stiff.

3-3-4- Chocolate dairy dessert scent

According to the results obtained from Table 5, it was determined that the use of konjac gum and sorbitol did not have a significant effect on the aroma of the treatments ($p < 0.05$). In other words, the addition of konjac gum and sorbitol improved the aroma, although not significantly, in the chocolate dairy dessert, but with an increase in the amount of konjac gum from 0.5% and sorbitol from 10.6%, this trend will decrease. Sorbitol is odorless but can affect the aroma and taste when combined with other ingredients, and konjac gum has a specific and slightly sweet smell, but it will not have a significant effect on the overall aroma and taste of the product. As Jarangi et al. (2011) reported, using konjac gum as a fat substitute in low-fat mayonnaise did not have a significant effect on the aroma and taste of the treatments [8]. Also, in another study,

Daghte et al. (2011) reported that using Shirazi Qadouma and Persian Qadouma in fatty cream samples did not cause a significant difference in the aroma and taste of the treatments because Persian and Shirazi Qadouma gums do not have a specific aroma and taste [6]. Complete replacement of sucrose with sorbitol and increasing the amount of sorbitol to 13.3% causes too much sweetness and creates a very cool state in the product, and complete replacement of konjac with cream and increasing the amount of konjac to 0.6% can increase the firmness of the product and have an adverse effect on the overall aroma of the product, creating a specific aroma and flavor in the product that is not desirable for everyone. Yousefzadeh and Taghizadeh in 1402, citing Javidi et al. in 2012, reported that in general, with increasing viscosity and consequently reducing mass transfer and aromatic compounds remaining in the deep parts of the ice cream, the aroma in the samples decreased [39]. The results obtained in the present study were consistent with those obtained by Gonzalez et al. in 2009, who reported that adding inulin as a fat mimic to dairy desserts did not significantly differ in the aroma and flavor of the samples [43]. According to the results, using sorbitol and konjac gum in excess of the tested amounts will not directly have a significant effect on the aroma and flavor of the product, but the negative effect of this increase in amount can affect the aroma of the product and make it undesirable.

3.3.5- Mouthfeel of chocolate dairy dessert

According to the results obtained from Table 5, it was determined that the use of konjac gum and sorbitol significantly improved the mouthfeel of the chocolate dairy dessert

treatments ($p < 0.05$). However, by increasing the amount of konjac beyond 0.5% due to excessive hardness, the improvement in the mouthfeel of the garlic product will decrease. Also, with the gradual increase in the amount of milk in the formulation, the amount of water and consequently ice in the dairy dessert increases and the firmness of the product increases, as shown in a study by Pourshani et al. in 1400, with the increase in the amount of balango gum and whey protein concentrate, the adhesion and cohesion of fat-free ice cream samples increased significantly. Oral coating is a film that covers the surface of the mouth, and adhesion in dairy desserts and sauces is a sticky state that is felt by the tongue and palate [41]. The increase in ice volume due to the presence of a greater amount of water resulting from the removal of fat in the ice cream formulation led to an increase in the hardness of the samples compared to the control sample. Also, the great ability of gums to establish bonds with water molecules can be the reason for overcoming the formation of a protein-fat matrix. It can be said that fat, due to occupying part of the space and also having a hydrophobic nature, has an inhibitory effect on the formation of hydrogen bonds between water molecules and gum, so that with the removal of fat, the aforementioned connections increase. By using larger amounts of gum and protein in the formulation, it is obvious that the possibility of forming these types of internal bonds increases and as a result, more force is required to rupture the tissue of the samples [41]. As reported in a study in this regard by Toker et al. in 2013, dairy dessert samples containing carrageenan gum had improved elasticity and gelling properties, which itself indicates why carrageenan gum is widely used in dairy products [25]. Also, Yousefzadeh and

Taghizadeh in 2013, in their study of the use of tragacanth gum and wheat starch as a substitute for gelatin in dairy desserts, showed that in general, increasing the concentration of hydrocolloid led to an increase in the sensory and mouthfeel scores [39]. In general, samples are evaluated in terms of adhesion (defined as the amount of work required to overcome the forces between the food surface and the surface in contact with it, such as the probe of the device or the teeth and tongue), cohesion (the energy required to achieve a specific deformation and represents the strength of the internal bonds of the material, in other words, it is related to the forces of attraction between particles and acts to prevent the material from disintegrating [41]. and sweetness have improved significantly, but increasing the amount of sorbitol from 10.6% will increase the cool taste of the product, which is not desirable for everyone. Aafi et al. in 2019, in a study of replacing sugar with sorbitol in strawberry marmalade, showed that increasing sorbitol in the treatments reduced the mouthfeel and, consequently, sensory desirability [26]. Also, the results obtained in the present study were consistent with the results obtained by Karbalai Amini et al. in 1400, who showed that adding balango gum to low-fat milk dessert increased the softness of the samples and was desirable [34]. According to the results, using sorbitol and konjac gum in excess of the tested amounts can cause excessive hardness and increase the cool taste in the product, which is undesirable in terms of mouthfeel.

3-3-6- General acceptance of chocolate dairy dessert

According to the results obtained from Table 5, it was determined that the use of konjac gum and sorbitol significantly improved the overall

acceptance of chocolate dairy dessert treatments ($p < 0.05$). The addition of hydrocolloids plays an important role in product formulation and overall consumer acceptance [41]. In this regard, Daghte and colleagues presented in 1400 that by increasing the amount of Shirazi and Persian Qadomu gums in cream with 18% fat, the overall acceptance rate increased significantly [6]. Also, Moholi and Lashkari presented in 1399 that by adding 10% grape juice to a dairy dessert sample, the overall acceptance rate of the product increased [27]. However, by increasing the amount of sorbitol above 10.6% and the amount of konjac above 0.5%, due to excessive sweetness, the aroma resulting from the excessive amount of konjac, darkening of the product color, excessive firmness of the concentration, and excessive cooling sensation in the mouth, the overall acceptance of the product will decrease, as Seyed Mahmoudzadeh and Ahmadi Dastgerdi presented in 2020. By increasing the amount of inulin to 4% by weight and by increasing stevia to 3%, the overall acceptance increased, and beyond these values, acceptance decreased [19]. Also, in 2019, Aafi et al., in their study of the effect of replacing sugar with sorbitol in strawberry marmalade, showed that by using sorbitol up to a maximum of 38% of the amount of sugar consumed, a product with similar characteristics and acceptability to the control sample can be achieved [26]. According to the results, using sorbitol and konjac gum in excess of the tested amounts can reduce the level of satisfaction with the product in terms of taste, aroma, texture, etc., which is not desirable.

4- Conclusion

The results of chemical tests on samples of chocolate dairy desserts containing sorbitol

and konjac gum showed that the pH level was highest in treatment 4 (containing 3.13% sorbitol and 6.0% konjac gum) and lowest in the control treatment. The acidity level was highest in treatment 4 and lowest in treatment 2 (containing 8% sorbitol and 4.0% konjac gum). The protein content was highest in treatment 4 and lowest in treatment 1 (containing 4% sorbitol and 0.3% konjac gum). The total calories, total sugars, and fat were highest in the control treatment (containing 10% sucrose and 25% fat and no sorbitol or konjac gum) and lowest in treatment 4. The texture score was highest in treatment 3 (containing 6.10% sorbitol and 5.0% konjac gum) and lowest in the control treatment. The color score was highest in treatment 3 and lowest in the control treatment. The taste score was the highest in treatment 3 and the lowest in the control treatment. The smell score was the highest in treatment 3 and the lowest in treatment 1. The mouthfeel score of the chocolate dairy dessert was the highest in treatment 3 and the lowest in treatment 2. The overall acceptance score was the highest in treatment 3 and the lowest in the control treatment. The results showed that the use of konjac gum and sorbitol is effective in improving most of the physicochemical and sensory properties of chocolate dairy dessert. Treatment 4 (containing 13.3% sorbitol and 0.6% konjac gum) had a relatively higher nutritional value with appropriate levels of pH, acidity, protein, fat, total sugar and total calories, but since no significant difference was observed between treatments 4 and 3 in terms of most of the tested properties and only the amount of protein in treatment 4 had a relative increase, and considering that the amount of sugar, fat and calories in treatment 3 also showed a significant decrease, and also considering the

mission of the food industry to produce healthy products and to achieve consumer satisfaction, finally treatment 3 (containing 10.6% sorbitol and 0.5% konjac gum) was selected as the superior treatment. It should be noted that the present study was extracted from the thesis and, due to the limited time to conduct it and the lack of sufficient equipment, the treatments were made and tested with the mentioned amounts of materials. So that if these problems were not there, perhaps by making a new treatment, a more desirable sample would have been obtained between treatments 3 and 4. The focus of this study is more on the results of reducing the amount of sucrose and fat and, consequently, the total calories of the product. The investigation of properties such as microbial load, stability tests, etc. can be investigated in another study and in the continuation of this work.

Data Availability

To access more data related to this research, send your message to the corresponding author's email address: safarimaryam217@gmail.com.

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Authors Contributions

All activities were carried out by the author.

Conflict of Interest

The author confirms that she / he has no financial conflicts of interest or competing interests in this study.

5- Resources

[1] A B Saunders.2011.Dairy Desserts.Fonterra Research Centra, Palmerston North,New Zealand, Elsevir Ltd.All rights reserved.

[2] H.R.McCain, S.Kaliappan, and M.A.Drake.2018.Invited review: Sugar reduction in dairy products,American Dairy Science Association,*Juornal of Dairy Science*.101.8619-8640.

[3] Ghiyasi,F., Majzoubi, M., & Farahnaki, A.2014.Production of fuctional dairy dessert containing wheat germ and investigation of its physicochemical and sensory properties,*First National Conference on Snacks*.1-13 [in Persian].

[4] E.C.Morais, A.R.Morais, A.G.Cruz and H.M.A.Bolini.2014.Development of chocolate dairy dessert with addition of prebiotics and replacement of sucrose with different high-intensity sweeteners.*Journal of Dairy Science*.97 (5).2600-2609.

[5] Mohammadnejad Khiavi, N., Khodabandeh, M., Souti Khiabani, M. and Rezaei Mokaram, R.2020. Sugar alcohol and their role in the modern world of sweeteners,*7th National Conference on Applied Research in Agricultural Sciences*.1-19 [in Persian].

[6] Dakhte, R., Khani, M. & Dabirian, Sh.2021.Comparison of the effects of Shirazi and Persian Qodomeh gums as fat replacement hydrocolloids on the physicochemical and sensory properties of low-fat breakfast cream, *Journal of Food Science and Industry Research Iran*.17 (1).205-216 [in Persian].

[7] L.González-Tomás, S.Bayarri, A.J.Taylor, E.Costell.2008.Reology, flavour release and perception of low- fat dairy desserts.International Dairy Jornal.18.858-866.

[8] Jarangi, M., Abdul-Malki, F., and Ghiyashi-Tarzi, B.2022. The effect of adding konjac gum as a fat substitute on the rheological and sensory properties of low-fat mayonnaise, *Food Science and Nutrition*.19(1).29-45 [in Persian].

- [9] Nasuhian, A., Ahmadian, P., and Hojjatoleslami, M. 2023. Investigation of the effect of replacing stevia sweetener and adding gum to the seeds on the rheological properties of jelly. *Iranian Journal of Food Science and Technology*. 19 (133).358-349 [in Persian].
- [10] Yu-Chieh Lan, Lin-Shiuh Lai. 2023. Pasting and rheological properties of water caltrop starch as affected by the addition of konjac glucomannan, guar gum and xanthan gum, *Food Hydrocolloids*. 136.
- [11] Mahrooghi, M., Ghods Rouhani, M., and Rashidi, H. 2017. Investigation of the effect of adding konjac and xanthan hydrocolloids on textural properties of cheese. *Dispersive Process. Food Science and Industry*. 14(68).293-306 [in Persian].
- [12] R.F. Tester and F.H. Al-Ghazzewi. 2016. Beneficial health characteristics of native and hydrolysed konjac (*Amorphophallus konjac*) glucomannan. *Journal of Science Food Agric*. Volume 96.3283-3291.
- [13] Mohammadi, A., Ghods Rouhani, M., Najaf Najafi, M., and Kashani Nejad, M. 2019. Investigation of the effect of konjac gum, homogenization pressure, and fat content on the rheological properties of low-fat cream. *Food Science and Industry*. 16(87).239-251.
- [14] Najaf Najafi, M., Shatri, H., and Kashani Nejad, M. 2021. Investigation of the effect of konjac gum, marjoram seed gum, homogenization speed and fat on pH, texture and color of low-fat stirred yogurt, *Journal of Iranian Food Science and Technology Research*. 17 (1).55-67 [in Persian].
- [15] Hosseinipour, L., Qanbarzadeh, B., Mofid, V., Soltani, M. & Hosseini, H. 2023. Optimization of sensory characteristics and investigation of rheological properties of low-calorie dairy dessert containing sucralose-sorbitol sweetener by design method. D-Optimal Mixture, *Journal of Industrial Research Food*. 1 (33).164-143 [in Persian].
- [16] D.H. Goff and W.K. Jordan. 1984. Aspartame and Polydextrose in a Calorie-Reduced Frozen Dairy Dessert. *Journal Of Food Science*. Volume 49.306-307.
- [17] Laura T. Rodriguez Furlan, Mercedes E. Campderros. 2017. The combined effects of Stevia and sucralose as sugar substitute and inulin as fat mimetic on the physicochemical properties of sugar-free reduced-fat dairy dessert. *International Journal of Gastronomy and Food Science*. Volume 10.16-23.
- [18] A.M. Ewis. 2021. Making of Low Calorie Functional Yoghurt Drink Enriched with Oat Seed and Stevia Leaves Powders (as Sweeteners). *Journal of Food and Dairy Sciences*. 12 (3).59-64.
- [19] Seyed Mahmoudzadeh, A. and Ahmadi Dastgerdi, A. 2021. The effect of stevia and inulin on the physicochemical, antioxidant and sensory properties of low-calorie chocolate dairy dessert. *Journal of Food Processing and Preservation*. 12 (2) [in Persian].
- [20] Institute of Standards and Industrial Research of Iran. 2022. Milk and milk products – Determination of titrable acidity and pH – Test method. Number 2852 2nd Revision [In Persian].
- [21] Institute of Standards and Industrial Research of Iran. 2021. Determining total nitrogen content of milk (kjeldal method). Number 639 [In Persian].
- [22] Institute of Standards and Industrial Research of Iran. Milk-Determination of fat content. Number 384 [In Persian].
- [23] Institute of Standards and Industrial Research of Iran. 2020. Ice cream-Specifications and test methods. No 2450 [In Persian].
- [24] Toliti, G., Beig Mohammadi, Z., and Labiki, G. 2022. Feasibility study of dairy dessert production enriched with microalgae *Spirulina platensis* and stevioside and investigation of its physicochemical and sensory properties. *Iranian Journal of Food Science and Technology*. 127 (19).47-60 [In Persian].

- [25] O.S.Toker, M.Dogan,E.Caniyilmaz, N.B.Ersoz, and Y.Kaya.2013.The Effects of Different Gums and Their Interactions on the Rheological Properties of a Dairy Dessert:A Mixture Design Approach.Food Bioprocess Technol.Volume 6.896-908.
- [26] Aafi, L., Rufeh Garinejad. and Sofi, M.2019.The effect of replacing sugar with low-calorie sweetener sorbitol on the physicochemical and sensory properties of strawberry marmalade.*Food Science and Technology*.16 (88).172-161 [In Persian].
- [27] Mahsoli, L. and Lashkari, H.2020.Feasibility study of producing dairy dessert containing grape juice and evaluation of its physicochemical, microbial and sensory properties.*Journal of Food Science and Technology Research*.16 (2).301-311 [In Persian].
- [28] M.Sedaghati., M.Hosseiny.2023.Production and Characterization of Milk Dessert Supplemented with Date Seed Powder.*Iranian Journal of Chemistry and Chemical Engineering*.42 (9).2891-2898 [In Persian].
- [29] Ahmadian, H., Beig Mohammadi, Z., and Soltani, M.2023.Investigation of the physicochemical and sensory properties of a functional dairy dessert drink containing Moringa oleifera and Spirulina platensis. *Food Processing and Preservation*.15 (1).1-22 [In Persian].
- [30] Sh.Zare and H.Lashkari.2021.Production and Characterization of Flavored Dairy Dessert Containing Grape Juice Concentrate.*Iranian Journal of Chemistry and Chemical Engineering*.40 (6).2028-2041.
- [31] Jafarpour, D. and Ataei, P.2021.Investigation of the effect of konjac gum on the physicochemical, textural and sensory properties of surimi obtained from small goaf fish(*Anodontostoma chacunda*).*Food Processing and Preservation*.17-36 [In Persian].
- [32] Faghihzadeh Gorji, A. and Sharifi, A.2019.Investigation of physicochemical, microbial and rheological properties of gelatin dessert containing stevia sweetener.*Journal of Innovation in Food Science and Technology*.11 (4).1-11 [In Persian].
- [33] Miani Sariazdi, S., Aalami, M., Aminifar, M., Ghaffarpour, M., Dastmalchi, F., Maqsoodlo, Y. and Mohammadi, M.2016.Investigation of the physicochemical, textural and sensory properties of a functional dairy dessert containing uncoated barley malt.*Iranian Biosystems Engineering*.47 (3).501-509 [In Persian].
- [34] Karbalai Amini, S., Aminifar, M., Yousefi, Sh. and Heydarzadeh, M.2021.The effect of native gums of Shirazi fenugreek and balango on the sensory characteristics of low-fat dairy dessert using principal component analysis (PCA).*Journal of Food Industry Research*.31 (3).109-118 [In Persian].
- [35] Khoshdari Rad, A. and Goli, M.2021.Optimization of dietary lozenge formulation by replacing sugar and almond kernels with acetoside-isomalt and Ganoderma lucidum by response surface methodology.*Journal of Food Industry Research*.31 (2).173-199 [In Persian].
- [36] Zabihi, F. and Karajian, H.2024.Evaluation of physicochemical and textural properties of dairy dessert containing millet flour as a substitute for rice flour.*Iranian Journal of Food Science and Technology*.19 (123).329-340 [In Persian].
- [37] Mehrabi, Z. and Goli, M.2018.Production of milk dessert based on date honey, corn starch and gelatin formulation using response surface methodology (RSM).*Journal of Iranian Nutritional Sciences and Food Industry*.13 (3).115-125 [In Persian].
- [38] Hadidi, F., Gonjaloo, A., and Fakur, M.2023.Evaluation of the effect of tragacanth and stevia gum on the physical, chemical, and sensory properties of non-dairy dessert based on almond milk during cold storage.*Iranian Journal of Food Science and Technology*.19(131).59-70 [In Persian].

- [39] Yousefzadeh, F. and Taghizadeh, M.2023.The effect of tragacanth gum and wheat starch as gelatin substitutes on the rheological, physical and sensory properties of dairy desserts.*Journal of Food Science and Technology Research*.19 (2).309-291 [In Persian].
- [40] J.E.Romanchik-Cerpovicz, A.C.Costantino, and L.H.Gunn.2006.Sensory Evaluation Ratings and Melting Characteristics Show that Okra Gum Is an Acceptable Milk-Fat Ingredient Substitute in Chocolate Frozen Dairy Dessert.*Journal of the American Dietetic Association*.106 (4).1-4.
- [41] Poursani, P., Razavi, M., and Mazaheri Tehrani, M.2021.The effect of some fat substitutes on the textural, physical, and sensory properties of fat-free ice cream.*Iranian Journal of Food Science and Technology*.18 (112).97-112 [In Persian].
- [42] Arabi, A., Mehraban Sang Atash, M., Karajian, R., and Ehtiati, A.2019.Optimization of non-dairy fermented dessert formulation based on almond milk.*Food Science and Industry*.16 (94).113-126 [In Persian].
- [43] L.González-Tomás, S.Bayarri, and E.Costell.2009.Inulin-Enriched Dairy Desserts:Physicochemical and Sensory Aspects.American Dairy Science Association.*Journal of Dairy Science*.92 (9).4188-4199.



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بررسی خواص فیزیکوشیمیایی و حسی دسر لبنی شکلاتی کم کالری حاوی صمغ کنجاک و سوربیتول

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با وجود نقش مهمی که قند و چربی در ساختار و فرمولاسیون مواد غذایی ایفا می کنند، تلاش های زیادی در جهت کاهش این مواد و جایگزین کردن آن ها به دلیل اثرات زیان بار ناشی از استفاده زیاد، صورت گرفته است. جایگزین های قند و چربی هر یک دارای ویژگی های منحصر به فردی هستند که می توانند در بهبود کیفیت محصول نهایی تأثیر گذار باشند اما باید بتوانند خواص مشابهی را از نظر ویژگی های فیزیکوشیمیایی و حسی مانند بافت، رنگ و طعم ایجاد کنند و ارزش تغذیه ای محصول را افزایش دهند. در تحقیق حاضر از قند الکلی سوربیتول به عنوان جایگزین ساکارز و از صمغ کنجاک به عنوان تقلیدکننده چربی بر پایه کربوهیدرات در تهیه نمونه های دسر لبنی شکلاتی استفاده گردید و سپس تأثیر آن ها روی برخی از خواص فیزیکوشیمیایی و کالری کل و برخی از خواص حسی و پذیرش کلی مورد مطالعه قرار گرفت. ارزیابی آماری با استفاده از آنالیز واریانس و آزمون چند دامنه ای دانکن با سطح احتمال خطا ۰/۰۵٪ با نرم افزار SPSS انجام شد. میزان pH در نمونه های حاوی سوربیتول و صمغ کنجاک در مقایسه با نمونه شاهد افزایش معنی داری را نشان داد، میزان اسیدیته و مقدار پروتئین در نمونه ها در مقایسه با نمونه شاهد ابتدا کاهش و سپس افزایش معنی داری را نشان داد و مقدار چربی، قند کل و کالری کل نمونه ها نسبت به نمونه شاهد کاهش معنی داری را نشان داد. همچنین مشخص گردید که اکثر نمونه های حاوی سوربیتول و صمغ کنجاک در مقایسه با نمونه شاهد در ارزیابی ویژگی های حسی، امتیاز بالاتری را کسب کردند. در آخر تیمار شماره ۳ که مقدار سوربیتول آن ۱۰/۶٪ و مقدار صمغ کنجاک آن ۰/۵٪ بود به عنوان تیمار برتر معرفی گردید.