Determining quality attributes of cupcakes by watermelon puree and stevia sweetener

Abstract

Utilizing stevia instead of sucrose to cut calories and improve nutritional value of cake, and using internal watermelon skins to prepare puree to substitute fats in cupcakes. Muffins technological and sensory evaluation was conducted. By creating a product with high nutritional value and low in fat, utilizing vegetables' high fiber content, creating a new product with high nutritional and biological value, and taking advantage of various minerals from their natural sources, watermelon peels can be used to their fullest potential economically and for health reasons. The muffin blends and formulas were made, and we performed all necessary analyses (chemical, physical, sensory assessment, and texture for muffins).The findings demonstrated that while weight increased with increasing purée, volume and specific volume considerably reduced. So that the muffins volume was small at 100% replacement level. Using watermelon puree and stevia in place of butter and sucrose in baking resulted in a negligible improvement in cohesion, chewiness, and hardness. However, there was no difference between the acceptability of the low-calorie muffins and the control cake until 75%. The addition of (watermelon and stevia) did not cause any unfavorable changes in flavor, aroma, or color. The panelists agreed that the watermelon and stevia muffins high moisture level was acceptable. Results showed that puree and stevia are effective at lowering the amount of fat and calories in muffins and are a suitable fat and sugar substitute.The final product had higher levels of protein, ash, fiber, and minerals, and the muffins hadhigh acceptance. Low-calorie muffins contained more moisture and were more moist, but they were still secure and maintained quality.

Key words: watermelon peel, fat replacer, stevia.

Introduction

A significant energy source for growth and development, dietary fat also supplies the necessary fatty acids required to maintain the integrity of cell membranes and to produce prostaglandins. Additionally, fat facilitates the absorption of various phytochemicals and fat-soluble vitamins (ADA Reports, 2005).Obesity is now considered to be a public health hazard. Since the 1980s, the prevalence of obesity has tripled in the nations that make up the WHO European Region (WHO, 2007).Fat gives baked food products crucial sensory qualities, such as color, taste, texture, and odor, all of which help to increase consumer approval. Foods that are baked, such crackers, cakes, and biscuits, often have high fat content. But there is a rising need for wholesome snack foods with lower fat content. Fat replacers have been used to retain consumer approval while also lowering the overall fat level(Collaet al., 2018).A variety of fat substitutes, including complex carbohydrates, gums and gels, whole food matrices, and their combinations,

have been studied in baked food products. Each fat substitute has unique qualities that can change a food product's quality (Colla et al., 2018). The three main sources of fat substitutes are carbohydrate-, protein-, and fat-based. (Jones, 1996). Fat replacers are employed in a number of items, from baked goods to frozen desserts, to give some or all of the beneficial characteristics of fat while giving less calories than the fat being replaced. The best usage of fat substitutes is when they aid in calorie management and when they promote the consumption of meals rich in essential nutrients (ADA Reports, 2005).Vegetable puree shown that purees are a suitable fat substitute in cakes and effective in lowering the amount of fat and consequently the calorie content. Cakes made with up to 50% puree (for both squash and cantaloupe) did not differ from the control cake in terms of volume or appearance. Puree was added, but no unfavorable color changes occurred. While the panelists preferred cakes with puree because of their high moisture content (Hussien, 2016).The substitution of fruits or vegetables for baked goods, which are known to have a high proportion of fat, results in healthier options (Pooja et al., 2018).Another form of carbohydrate-based fat substitutes is fruit-based. Individually, starch, pectin, and cellulose, as well as some types of fruit, have the potential to be effective fat substitutes. The moisture content of products with lower fat was raised using carbohydrate-based fat substitutes (Kalinga, 2010).One of the Cucurbitaceae family's most economically significant fruits is the watermelon (Citrulluslanatus). Worldwide, subtropical and tropical regions have successfully grown and farmed it [1-3] Olayinka, B.U.andEtejere, E.O.(2018), . Saediman, H.et. al., (2020)and Masika, F.B.et. al.,(2022) . According to the Food and Agriculture Organization Statistical Database (FAOSTAT) (2022). [4], China was the world's top producer of watermelons in 2022, turning out 60.25 million tonnes (with a total production of 101.62 million tonnes). Turkey, India, Iran, and Algeria were the next largest producers, followed by China. Future watermelon production is anticipated to follow the current upward trend.Watermelon fruit is a good source of nutrients for humans, according to numerous scientific research. They contain a wide range of crucial elements, such as vitamins, minerals, organic acids, proteins, sugars, and amino acids [5-7] Perkins-Veazie., et., al. (2006), . Assefa, A.D., et,al. (2022) and Aslam, A. et.,al.(2021). Alkaloids, flavonoids, glycosides, phenols, tannins, terpenoids, saponins, and steroids are a few more useful chemical components found in watermelon fruits that have positive pharmacological effects [8,9]Deshmukh, C.D.et.,al.(2015) and Manivannan, A. et.,al. (2020). Due to these substances' antimicrobial, anticancer, antiulcer, antioxidant, anti-inflammatory, antihypertensive, analgesic, and antigiardial properties, which enable them to function against prosthetic hyperplasia and serve as atherosclerosis, gastroprotective, hepatoprotective, and laxative agents, they can be used in therapeutic approaches [8–11]Deshmukh, C.D.et.,al.(2015), Manivannan, A. et.,al. (2020), Maoto, M.M.et.,al.(2019) and Nadeem, M.et.,al.(.2022). Faizy,et al., 2020 revealed that Watermelon peels contain 6.77 grams of protein per 100 grams, 0.92 grams of fat per 100 grams, 13.2 grams of ash, 24 grams of fiber, 53.59 milligrams of sodium, 2074 milligrams of potassium, 468 milligrams of calcium, 0.59 milligrams of copper, 12.08 milligrams of iron,

164.48 milligrams of magnesium, 0.91 milligrams of zinc, 107 milligrams of phosphorus.

The watermelon peel can also be regarded as a good source of nutrients, polyphenols, and antioxidants.The component stevia, sometimes referred to as Stevia Rebaudiana, can be used as a natural sweetener. Because it contains glycosides, the stevia plant has a sweet flavor (Retnani and Anggraeni, 2005). Stevia extracts have a sweetness level that is 200–300% higher than sugar's (Depuydt, 2002). Stevia has a glycemic index of zero, honey ranges from 30 to 58, and sugar has a glycemic index of roughly 58, making it a great choice for diabetics. (Cloe, 2013).Stevia and stevioside are safe when used as sweeteners, according to Geuns (2000) and Anita et al. (2008). Both are suitable for people with diabetes, phenylketonuria, and obesity who want to lose weight by cutting out sugar supplements from their diet.Stevioside and steviol, which operate directly on beta cells to promote insulin secretion, may be used as anti-hyperglycemic medications in the treatment of type 2 diabetes mellitus. Additionally, the Stevia Sweetener is heat stable up to 200°C and stable in both wet and dry food systems (Apurba et al., 2014).It would be advantageous for the food industries to develop the novel formulations for cakes and biscuits with stevia as a sucrose substitute and produce products with good quality and achieve consumer acceptability (Magorzata and Anna 2015). Currently, the European Union has approved steviol glycosides with the E 960 symbol for use in 31 food categories.In many foods, including cupcakes, butter and sucrose are the main ingredients in significant concentrations. The goal of the current study was to determine how different fat replacement levels—watermelon puree and stevia sweetener—affected the quality attributes of cupcakes.

Materials and methods

Materials:

-Wheat flour 72 % was obtained from South Cairo Milling Company, Giza, Egypt.
-All chemicals were used in theexperiment were obtained from Egyptian Scientific Company, El-Dokki, Giza, Egypt. Stevia was purchased from super market, Giza, Egypt. All baking ingredients such as butter, sugar, eggs, baking powder, vanillin and watermelon were obtained from local market, Giza, Egypt.

Methods:

Puree production

Watermelon puree preparation: After choosing a watermelon, it was washed with tap water to get rid of any dirt and debris. It was peeled from the outer peel, and the white peel was chopped into small pieces. 100 ml of water containing 0.2% calcium propionate was added, and the mixture was boiled for 8 to 10 minutes at 100 OC. It was then allowed to cool at room temperature before being blended to achieve a smooth texture, and it was then placed in plastic bags and frozen until it was needed Fraikue et al., 2018.

- **Cake preparation:**

Preparation cake, the following recipe was used using the method from Hussien et al., 2016, with a few modifications: 140 grams (72% extraction rate) of wheat flour, 120 grams (milk butter), 120 grams (sucrose), 67.5 grams (whole eggs), 2.25 grams (baking powder), 2.25 grams (vanilla), and 50 milliliters (ml) of water. As can be seen in Table (1) from Sanggramasari 2019, stevia powder has taken the place of sugar.

In a bowl, sugar and butter were creamed for three minutes at medium speed. After that, for two minutes, eggs and vanilla were added and blended in at the same pace. The batter was combined at a high speed for 4 minutes after the addition of the flour, baking powder, and water. The batter was then stirred for an extra minute at the same speed after cleaning the bowl. Watermelon puree was used to replace 25, 50, 75, or 100% (fat weight basis) of the butter in the formula for fat replacer treatments. Stevia was used in place of sugar at a rate of 100%, as demonstrated. Stevia dosage as a substitute for sucrose is determined by sweetness, as stated in Table (1).

Table (1) formula of producedcupcakes

Ingredient (g)	**Control**	**1**	**2**	**3**	**4**	**5**
Flour	140	140	140	140	140	140
Butter	120	120	90	60	30	-
watermelon puree	-	-	30	60	90	120
Sugar	120	-	-	-	-	-
Stevia	-	3.02	3.02	3.02	3.02	3.02
Eggs	67.5	67.5	67.5	67.5	67.5	67.5
Baking powder	2.25	2.25	2.25	2.25	2.25	2.25
Vanillin	2.25	2.25	2.25	2.25	2.25	2.25

Sensory evaluation

Cake samples were evaluated based on their flavor, texture, taste, color, and total score by a panel of ten highly experienced panelists from the Food Technology Research Institute, as stated by Bennion and Bamford in 1997.

Chemical analysis for cakes.

-Moisture, fat, ash, crude fiber and crude protein (N x 5.7) and essential minerals were determined for according to **AOAC (2012)**.

-Available carbohydrate was calculated by difference, 100-(protein + fat + fiber + ash) **Fraser and Holmes, (1959).**

-Total calories were calculated according to **FAO/WHO (1991)** as follows: E= 4 X (Carbohydrate % + protein %) + 9 X (fat %).

Determination of minerals:

Mineral determination: In accordance with AOAC (2012), the mineral content (Ca, Fe, and Zn) of samples of the baked cupcakes was assessed using Perkin Elmer's (Model 3300, USA) atomic absorption spectroscopy (AA- 6800, Japan).

Profile Texture Analysis:

Using a Texture Profile Analyzer (TPA), Baixauli et al. (2008) measured the hardness, cohesiveness, and springiness of the crumb. A universal testing device (Brook field Engineering Lab. Inc., Middleboro, MA 02346- 1031, USA) was used to determine the specifications for cake texture. In a TPA, a cylindrical probe with a 25 mm diameter was employed at a speed of 2 mm/s.

-**Physical Properties for Cakes:**

Weight, volume, and specific volume are all physical properties. Weight (g) was calculated using the AACC2000 method, and volume (ml) was measured by seed displacement. The AACC 2000 method was used to determine the specific volume as the ratio of apparent volume to weight. The measurements were carried out three times. Using a RotronicHygro Lab EA10-SCS (Switzerland) aw meter, water activity (aw) was measured. The measurements were carried out three times.

-**Sensory Evaluation**:

Cake samples were packed, allowed to cool to room temperature (25°C), and then evaluated for organoleptic qualities. According to Bennion and Bamford's 1997 account, ten expert panelists from the Food Technology Research Institute personnel at the Agriculture Research Center in Giza, Egypt, scored cakes for color, texture, taste, flavor, space distribution, and overall score.

Statistical analysis:

Snedecor and Cochran (1980) used the least significant difference value (LSD) at 0.05 levels of probability to statistically assess the results for chemical composition and sensory evaluation.

Results and discussion

With the 100% puree sample having the highest moisture content and the control having the lowest, fat replacement had a statistically significant impact on

moisture content. These results are consistent with studies byHussien (2016) who noted that a high fiber content in cake could impact the moisture content. The moisture increased dramatically as a result of the addition of puree because high fiber content absorbs more water. According to Hemada et al. (2016), Sample 1 with 100% stevia had a substantial increase in moisture compared to the control.

Water availability for biological reactions is gauged by the term "water activity" (aw). It controls how well microorganisms can grow. It has already been acknowledged as a crucial element in assessing a product's safety or shelf life (IFT/FDA 2001; Kilcast&Subramaniam 2000). A lot of cupcakes are shown in Table 2. Data showed that, in contrast to the control (0.71), the aw values of the various cupcake samples gradually increased from sample 1 to sample 5 in samples 1, 2, 3, and 4. where sample 5 had the highest average weight (0.85). Their water content may be the cause of this. The addition of watermelon puree steadily increased the water content in samples 1, 2, 3, 4, and 5. Foods were deemed to be non-potentially dangerous according to Rockland &Nishi in 1980 when their aw was less than 0.85, which is below the water activity for Staphylococcus aureus growth and toxin generation. According to Cook & Johnson (2010), aw is a significant element that influences the spoiling of various bakery items, including breads and cakes, when it has levels above 0.94.

The stability, keeping safety, and quality of the prepared cupcakes, whose aw is less than or equal to 0.85, can be predicted from the results concerning wa described above.

Table (2) moisture and water activity from produced cakes:

Samples	Moisture %	Water activity
Control	22.5e±5.0	0.71a±0.3
1	22.5e±5.0	0.70a±0.3
2	25.11d±1.0	0.82a±0.2
3	27.4c±0.4	0.83a±0.1
4	28.8b±0.2	0.84a±0.1
5	30.11a±011	0.85a±0.1
LSD 0.05	0.87	0.29

*Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Physical properties of cupcakes:

The results are reported in Table 3, which compares the physical properties of cake products with various amounts of watermelon puree and stevia powder to

the control sample. By gradually increasing both of the substitutes (fat and sugar), the weight of the cakes in relation to the control values was dramatically raised. Volume is a crucial component of cakes that greatly affects consumer preference and is correlated with the kind and quantity of shortening used. The best value in samples 1 and 2, which were close to the control, was produced with 25% puree and 100% stevia. Index to volume values (as compared to control) were also shown to decrease as substitute amount increased. Cakes made with 75 and 100% puree and stevia had a lower baking quality. Hemada et al. (2016) reported similar results on the impact of stevia. The visual evaluation of the stevia-substitute chiffon cake tended to be lower in volume. Sanggramasari reported in 2019 that all the chiffon cakes made no high-pitched noises.

Cakes with higher levels of fat replacement had a smaller volume (100.72 cm in sample no. 5 compared to 137.5 cm in the control). Cake volume varied significantly between control cakes and those made with puree at 100% replacement levels; the latter had the lowest cake volume. This may suggest that fat substitutes had the capacity to retain more air into the batter (reduced specific gravity) and preserved more air during the final stage of baking (larger cake volume), according to Khalil 1998 and Raeker and Johnson (1995). Cakes produced less volume when baked as substitution grew (over 50%), indicating that the final product is less aerated and denser.These findings concur with Borneo et al. (1997). A batter with less air included or a high specific volume typically has a lower volume and specific volume.

Table (3) physical characteristics of produced cupcakes

Sample	Weight g	Volume cm3	Specific volumecm3/g	Density g/cm3
Control	70.5e±0.5	137.5a±0.5	1.95a±0.1	0.51abcd±0.1
1	70.5e±0.5	127.71b±0.3	1.65b±0.1	0.61abc±0.1
2	77.30d±0.3	127.71b±0.3	1.65b±0.1	0.61abc±0.1
3	86.5c±0.5	115.43c±0.4	1.33c±0.1	0.75ab±0.3
4	101.2b±1.1	105.52d±2.0	1.04d±0.1	0.96a±0.1
5	109.87a±0.58	100.72e±0.72	0.92d±0.1	0.09a±0.1
LSD 0.05	1.05	1.60	0.16	0.26

*Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Texture Profile Analysis

Cakes were subjected to Texture Profile Analysis (TPA), which yielded the textural parameters (hardness, cohesiveness, springiness, and chewiness) that

are displayed in Table (4).It can be said that the control cake's texture was particularly soft, light, moist, and fluffy. The stevia-substitute cake developed a little harder texture in the meanwhile.

Hardness, cohesiveness, and chewiness increased insignificantly when fat was replaced with watermelon puree. For control and 100% replacement, the hardness of the substituted cakes increased from 11.01 to 12.04, respectively. These findings support the findings of Hussien (2016), GrigelmoMiguel et al. (2001), and Zahn et al. (2010), who found that fiber-based fat substitutes increased the hardness (firmness) of cakes. The decrease in the quantity of air bubbles that are integrated into the batter during beating and expand during baking as a result of fat reduction was cited by Indrani and Rao (2008) and Sahin (2010) as the cause of the increase in hardness. According to TPA results, samples 1, 2, 3, 4, and 5 were gradually harder and chewier than the control.

The increase in fiber content in these samples may be the cause of the increase in hardness and chewiness. By calculating the amount of recovery between the first and second compressions, springiness quantifies elasticity. With more watermelon puree added than in the control, the springiness steadily decreased. The springiness rating decreased when puree was used, although it did not differ significantly from the control cake. This trend is due to the fiber present in these samples. In line with Abdel-Haleem and Hafez (2015), our current findings.

Table (4).Texture Profile Analysis (TPA) for produced cupcakes:

Sample	Hardness	Cohesiveness	Springiness	Chewiness
Control	11.01abc±0.5	0.32a±0.02	2.2a±0.2	6.1abc±0.4
	11.33ab±0.3	0.34a±0.1	1.9a±0.1	6.5a±0.4
1	11.33ab±0.3	0.34a±0.1	1.9a±0.1	6.5a±0.4
2	11.55a±0.5	0.35a±0.1	1.6a±0.2	6.71a±0.3
3	11.77 a±0.5	0.38a±0.1	1.55abc±0.5	6.9a±0.1
4	12.04a±0.2	0.41a±0.1	1.5abcd±0.5	7.11a±0.2
LSD0.05	0.67	0.14	0.55	0.49

*Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Sensory evaluation of produced muffins

The average scores for each organoleptic trait are shown in Table (5). The findings supported those reported by Hemada et al. (2016) and demonstrated that the flavor, color, and odor of the control cake and the cake made with stevia substitute were identical. Until 75% of the cakes' original flavor was replaced with watermelon puree and 100% of them with stevia powder, there were no

discernible differences in taste, smell, or color between the cakes. The results here concur with those of earlier studies in that butter makes just a small impact to the color and appearance of baked goods. Young and Cauvain. 2006 and Seker et al. (2010).

According to Hayek and Ibrahim (2013), a high moisture content in fruit or vegetable-based fat substitute is a key factor in determining the replacement %. The judges preferred cakes (with puree) with a high moisture level; this concurs with Hayek and Ibrahim (2013). Khalil 1998 and Hussein et al. (2011) showed that cakes made with 25 or 50% fat substitutes had higher mean scores for flavor and softness (moistness) than the control, which is consistent with our findings. There was no discernible difference in overall acceptance scores between the control, 25%, and 50% replacements, but the 75% and 100% replacements considerably differed from the control.

Table (5) Sensory evaluation of cakes

Sample	Color 10	Texture 20	Appearance 20	Taste 20	Odor 10	Space distribution 10	Overall acceptability 10	Total score 100
Control	9.5a±0.5	19.5a±0.5	19.5a±5.0	19.8a±0.2	10a±0.06	9.5a±0.5	10a±0.05	97.8a±0.3
1	9.5a±0.5	19.5a±0.3	19a±1.0	19.7a±0.3	10a±0.06	9.5a±0.5	9.7a±0.2	96.9a±1.0
2	9.5a±0.5	19.5a±0.3	19a±1.0	19.7a±0.3	10a±0.06	9.5a±0.5	9.8a±0.2	97a±1.0
3	9.0a±1.0	19a±1.0	19a±1.0	19.5a±0.2	9.5a±0.5	9a±1.0	9.5a±0.5	94.5b±0.8
4	8.0a±1.0	16b±1.0	17b±0.5	19.5a±0.5	9.6a±0.4	8.0ab±1.0	8b±1.0	84.1b±0.5
5	7.0b±2.0	15b±1.0	16b±0.5	18.0b±1.0	9.0ab±1.0	7.0abc±1.0	7c±0.5	79c±0.6
LSD 0.05	1.82	1.31	1.19	0.85	0.85	1.34	0.89	0.9

*Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Chemical composition of produced cupcakes:

The chemical analysis of cupcakes with and without added fat and sugar is shown in Tables (6). The protein level of the cake formula somewhat increased

after the puree was added. It was discovered that cake sweetened with stevia had lower fat contents than the control while having almost the same amounts of protein and moisture and ash. This research followed the same general pattern as that found in Hemada et al., 2016. In contrast to the 2011 research by Hussien et al., the results revealed a sharply significant drop in the amount of fat and calories in all samples with the fat being replaced by puree.

On the other hand, as the proportion of butter was reduced, the amount of fat in cakes decreased linearly. Because watermelon puree has a high fiber content, as reported by Faizy et al. in 2020, fiber, protein, and ash levels increased as replacement levels of puree increased. Additionally, levels of carbohydrates rose as replacement fat levels rose. Puree cakes with less fat were displayed. As anticipated, the replaced cakes' calorie value was much lower due to the decrease in fat content. These findings support Hussien's 2016 research. Between 4.82 to 24.63% less calories were consumed compared to the control group.

Table (6) Chemical composition of cupcake (on dry weight basis)

Sample	Protein %	Fat %	Ash %	Fiber %	Total Carbohydrates%	Calories kcal/100g	Reduction in calories %
Control	9.5ab±0.5	29.5a±5.0	2.27ab±0.3	0.16c±0.01	58.57e±0.2	537.78a±1.0	-
1	9.71ab±0.1	24.5b±1.1	2.47a±0.2	0.19c±0.01	63.13d±0.4	511.86b±0.2	4.82d±0.1
2	9.61ab±0.1	24.5b±1.1	2.47a±0.2	0.19c±0.01	63.23d±0.4	511.86b±0.2	4.82d±0.1
3	9.9a±0.1	15.5c±0.5	2.85a±0.1	0.22c±0.01	71.53c±0.5	464.22c±0.2	13.49c±2.0
4	10.15a±0.17	9.3d±1.3	3.01a±0.5	0.32b±0.11	77.22b±0.2	433.18d±0.1	19.45b±0.2
5	10.31a±0.3	4.0e±0.3	3.23a±0.2	0.45a±0.01	82.01a±0.2	405.28e±0.5	24.63a±1.0
LSD 0.05	0.45	1.13	0.47	0.08	0.46	0.83	1.79

*Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Minerals content of produced cupcakes (mg/100g):

The mineral content (Ca, Fe, and Zn) of cupcakes prepared with and without a fat- and sugar-replacer is shown in table (7). Ca, Fe, and Zn levels in the baked

good increased as a result of the inclusion of stevia and watermelon puree to the recipe. According to Faizy, et al. (2020), watermelon peels are a good source of Ca, Fe, and Zn, which may account for the increase in minerals. In comparison to the control values, the mineral content of the cake made with puree and stevia was better. It was discovered that stevia-sweetened cake had more iron than the control. According to Hemada et al. (2016), cakes baked with stevia had more Fe than the control.

Table (7) Minerals content for produced cupcakes (mg/100 g).

Sample	Ca	Fe	Zn
Control	85.0e±1.0	0.76e±0.2	0.64ab±0.1
1	86.31e±0.2	0.77e±0.5	0.67ab±0.1
2	183.52d±0.5	3.51d±1.0	0.85a±0.2
3	250.31c±1.0	6.42c±0.2	1.05a±1.0
4	339.4b±1.0	9.31b±1.0	1.27a±1.0
5	399.41a±1.0	12.72a±0.2	1.45a±0.2
LSD 0.05	1.35	1.01	0.69

Values are means of three replicates ±SD, number in the same row followed by the same letter are not significantly different at 0.05 level.

Conclusion:

The goal of this effort is to lower the energy content and price of the product while increasing the economic worth of internal watermelon peel by incorporating it into cupcakes that may not alter its technological qualities. Additionally, stevia was used as a natural sweetener in place of sugar. by investigating all the chemical, sensory, and technological characteristics. The findings demonstrated that watermelon puree and stevia are suitable sugar and fat substitutes for cakes and efficient at lowering fat and calorie content. There was no difference between the cakes made with up to 75% puree and 100% stevia and the control in terms of taste, odor, appearance, or general acceptability.

100% stevia was added, however no unfavorable changes in general acceptability were noticed. While the panelists preferred cakes with puree because of their high moisture content. This project aims to increase the economic value of internal watermelon peel while lowering the energy content and price of the product by inserting it into cupcakes that may not change its technological properties. As an additional natural sweetener, stevia was substituted for sugar. by examining every aspect, including the technological, sensory, and chemical ones.

The research showed that stevia and watermelon puree are effective sugar and fat alternatives for cakes that can reduce fat and calorie content. In terms of flavor, aroma, appearance, or general acceptance, the cakes made with up to 75% puree and 100% stevia were identical to the control.

By increasing the fat and sugar substitute, weight was increased; however, by progressively increasing the watermelon puree, volume and specific volume were reduced. None of the cake samples showed a discernible difference in the texture profile analysis. Because protein, fiber, ash, and minerals were enhanced in the cakes with both a fat and sugar replacement, they performed better than the control cake.

When compared to the control sample, the calories were reduced by 4.82 to 24.63% due to the replacement of fat and sugar. All cake samples were secure in terms of the value of wa, according to the required shelf-life.

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