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Investigating the effect of textured fiber supplement (apple pomace-oat bran) on the quality characteristics of muffin cake

Elnaz Milani[1*], Morteza Mirzaei[2]

1- PhD in Academic Jihad.
2- Master's degree in Academic Jihad, Kashmar

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*Corresponding Author E-

ABSTRACT

The increasing demand for food products with high quality and nutritional value has turned the use of dietary fibers into a challenge among researchers. In this project, the effect of textured (extruded) fiber supplement obtained from apple pomace-oat bran at levels of 0, 5, 10 and 15%, on the physicochemical and quality characteristics of the muffin cake containing moisture, consistency, porosity, crumb color, Hardness and overall acceptability were evaluated. The results showed that adding the texture supplement to the cake samples did not have a significant effect on their protein and fat, but it caused an increase in the percentage of moisture, fiber and ash in the cake samples. The addition of the fiber supplement caused a reduction of hardness in the samples during the storage period; So that the lowest amount of hardness was related to the muffin cake containing 10%. Examining the factors related to the color of the cake samples showed that the addition of fiber supplement to the cake samples decreased the whiteness, decreased the b* factor and increased a* factor. The results of the sensory evaluation of the samples showed that the addition of fiber supplement to the level of 10% caused an increase in aroma and taste, porosity and an increase in the overall acceptance score. While the consistency and porosity of the dough increased. The results of this research showed that the fiber supplement, as a food by-product, which is low price with a valuable source of nutritional compounds, can be successfully used to replace part of the flour applied for the production of baking products. The highest acceptability included the cake enriched with 10% textured fiber supplement powder.

1. Introduction

Lifestyle changes, lack of physical activity, and daily stress have contributed to the rise of various diseases [1]. The development of functional food products enriched with bioactive compounds can play a fundamental role in ensuring health [1]. Dietary fibers are non-starch polysaccharides that cannot be digested in the small intestine and are only partially or fully fermented in the large intestine, making them highly beneficial for human health. These compounds include cellulose, hemicelluloses, gums, and lignin [2]. The U.S. Food and Drug Administration (FDA) recommends a daily intake of 25–38 grams of dietary fiber. Baked products are among the most widely consumed and demanded food items worldwide. Among these, cakes have a particularly large consumer base across different segments of society [2, 3]. Given the health-promoting effects of dietary fibers, replacing flour with fiber in cake formulations—while maintaining sensory and technological properties—plays a significant role in ensuring food security and consumer health .Oat bran is a rich source of dietary fiber, protein, calcium, iron, magnesium, phosphorus, potassium, sodium, zinc, copper, manganese, selenium, B vitamins, and folate. The beta-glucan in oats helps regulate blood glucose levels in diabetic individuals. Apple pomace, a valuable by-product, is produced globally at approximately 2 million tons annually. It is rich in pectin and polyphenols, which enhance the antioxidant properties of food products. Therefore, if processed and reintroduced into the production cycle, it can contribute to sustainable agricultural development and high added value [2, 4].

One of the key technologies for processing dietary fiber sources to eliminate microbial contamination and improve functional properties on an industrial scale is food extrusion. This process involves breaking hydrogen bonds within and between hemicellulose and lignin chains, resulting in a material with a more porous structure and lighter color. The structural changes enhance water-holding capacity, fiber swelling and improve both technological and health-promoting properties [5, 7].

In a study by Lebesi and Tzia (2011), the effect of replacing flour with oat, corn, and rice bran (up to 30%) on the qualitative characteristics of cake during storage was investigated. The results showed that porosity and specific volume increased with dietary fiber addition, and a 10% supplementation level was found optimal for cake production [8]. Similarly, Milani et al. (2021) examined the effect of adding textured fiber supplements from coffee processing waste and wheat bran on the properties of muffins during storage. The results indicated a favorable impact of textured fiber up to 15% compared to the control sample. Therefore, in the present study, a composite fiber supplement was first produced using extrusion technology, and then the effect of adding textured fiber supplement at four levels (0%, 5%, 10%, and 15%) on the physicochemical and qualitative characteristics of muffins during storage was investigated .

2. Materials and Methods

2.1. Raw Materials

Apple pomace was collected from local juice shops and immediately dried in an oven. Oat bran was obtained from *A.A.B. Company*. The samples were ground using a laboratory mill and passed through a 50-mesh sieve to ensure uniform particle size. The moisture, ash, protein, fiber, and fat content of the raw materials were determined using the AOAC (2000) methods.

2.2. Production of Textured Fiber Supplement

Extrusion cooking was performed using a co-rotating twin-screw extruder (Model DS56, Jinan Saxin, China). The effects of feed moisture (12% and 16%) under constant extrusion conditions (barrel temperature: 140°C, feed rate: 40 kg/h, screw speed: 150 rpm, die diameter: 3 mm) on the water absorption and retention properties of the composite fiber supplement (oat bran: apple pomace, 1:1 ratio) were investigated. The optimal sample with improved water absorption capacity was selected for wheat flour substitution in cake production [1, 7].

2.3. Dough Preparation and Muffin Production

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A two-stage mixing method was used for dough preparation. In the first stage, all dry ingredients 100 g wheat flour, 70 g sugar, 12 g milk powder, 4 g baking powder, and the specified fiber supplement were mixed at low speed for 30 seconds. While mixing, water was gradually added to form the dough. In the second stage, the speed was increased, and the remaining water (38 g), 70 g egg, and 55 g liquid oil were added according to the formulation. Mixing continued at medium speed for 90 seconds. Then, 120 g of the mixture was poured into paper muffin molds and baked in an oven (Model ONIX, Italy) at 180–190°C for 25 minutes. The baked muffins were removed, cooled, and stored in polyethylene bags at room temperature (25°C) until further analysis [3].

2.4. Dough Consistency

Dough consistency was measured using a funnel with a wide opening diameter of 10 cm and a narrow opening diameter of 1.6 cm. The funnel was filled with dough, and the weight of the dough flowing out within 15 seconds was recorded. Consistency was reported in grams per second, with higher values indicating lower dough consistency [3].

2.5. Texture Analysis During Storage

A Texture Analyzer (Model Lloyd) was used to evaluate muffin texture during storage 1, 7, and 14 days post-production. Uniformly cut samples (2.5 × 2.5 cm) were subjected to compression using a probe. The probe speed before and during penetration was 1 mm/s. The maximum force (in Newtons) required to compress the sample was recorded [1].

2.6. Color and Crumb Porosity Evaluation

Crumb porosity was assessed using image-processing techniques [9]. Crust and crumb color were analyzed using a HunterLab colorimeter (following Sun et al., 2008) based on the parameters L*(lightness/darkness), a* (redness/greenness), and b* (yellowness/blueness) [10].

2.7. Sensory Evaluation

Sensory attributes were evaluated by a trained panel of 10 assessors. Parameters including color, appearance, aroma, taste, texture, and overall acceptability were scored using a 5-point hedonic scale within 2 hours after baking [11].

2.8. Experimental Design and Statistical Analysis

A completely randomized factorial design was used to study the effects of textured fiber supplementation (0%, 5%, 10%, and 15%) and storage time (0, 7, and 14 days) on muffin quality. Data were analyzed using Minitab 17, and mean comparisons were performed using Duncan's multiple range test at a 5% significance level.

3. Results and Discussion

3.1. Chemical Composition of Raw Materials and Final Product

The physicochemical properties of oat bran and apple pomace are presented in Table 1. The values obtained in this study were consistent with previous research, with minor variations attributed to factors such as cultivar, geographical region, and climatic conditions [2,4]. Among the two fiber supplements produced, a water absorption test was first conducted to select the optimal sample. The sample with 16% feed moisture was chosen as the final product for cake testing due to its higher water absorption and retention capacity (46%).

Regarding the effect of the textured fiber supplement on the fiber, protein, ash, and fat content of the cakes, mean comparisons revealed that the control sample had the lowest fiber content. Increasing the proportion of textured fiber supplement in the cake formulation led to a corresponding increase in fiber content, with the highest level observed in the 15% supplemented sample. The dietary fiber content in cakes containing the textured supplement ranged from 0.28% to 1.6%, indicating that the proposed formulation could increase dietary fiber content up to 6-fold compared to the control cake.

These physicochemical changes in fiber are associated with the high-temperature and high-shear conditions of extrusion processing. Thermomechanical processing causes partial redistribution of insoluble dietary fiber into soluble fiber compounds, thereby increasing total fiber content. This increase may be due to fragmentation or breakdown of other insoluble fiber components [5,12].

In another study, dried apple pomace was used as a source of fiber and polyphenols to enrich sponge cakes. Apple pomace powder replaced wheat flour at 5%, 10%, and 15% levels, and

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the physicochemical and rheological properties of the cakes were reported. Cake volume decreased while water absorption increased. The polyphenol and fiber content of the enriched cakes also increased [2].

Mean comparisons showed that increasing the proportion of the textured fiber supplement in the cake formulation led to higher ash content. According to Duncan's test, supplementation up to 15% resulted in a significant difference compared to the control. The increased ash content in the cake samples indicates a high mineral content, primarily including potassium, calcium, magnesium, sulfur, and phosphorus [11].

The addition of oat bran significantly increased ash content due to its higher mineral content compared to wheat flour. Research has also shown that increasing oat dietary fiber content in gluten-free cakes leads to higher ash content compared to the control, which aligns with the findings of this study [13].

TABLE1. Proximate compositions (g/100g) of Apple pomace (AP) and Oat Bran (OB)

Component	Apple pomace (AP)	Oat Bran (OB)
Fat	2.25±0.189	7.44±0.25
Protein	2.35±0.149	16.78±0.509
Ash	1.69±0.366	2.75±0.51
Moisture	8.12±0.4	6.35±0.24
Total Fiber	58.31±0.709	16.34±0.424
Soluble Fiber	12.82±1.22	5.95±0.99
Insoluble Fiber	35.68±0.709	10.31±0.709

TABLE 2. The effect of fiber supplement addition on physicochemical properties of cake

Treatment	Fat (%)	Protein (%)	Ash (%)	Total fiber (%)
Control	19.05^{a}	8.5^{a}	1.45^{b}	**0.93 ^{d}**
Fiber supplement (5%)	20.34^{a}	8.57^{a}	1.48^{a}	**3.67 ^{c}**
Fiber supplement (10%)	19.03^{a}	8.46^{a}	1.58^{a}	**7.66 ^{b}**
Fiber supplement (15%)	20.20^{a}	8.45^{a}	1.71^{a}	**11.58^{a}**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

3.2. Effect of Fiber Supplement Type on Dough Consistency

Dough consistency, measured as the flow rate of semi-solid materials (i.e., the amount of dough passing through a funnel per second), is a critical parameter in determining product quality and processing efficiency. Increased dough consistency prevents the escape of air bubbles incorporated during initial mixing, resulting in a well-aerated and porous cake structure. However, excessively low or high dough consistency leads to reduced cake volume [3].

The effect of fiber supplementation on cake dough consistency is illustrated in Figure 1. Since the Bostwick value is inversely related to dough consistency, results showed that increasing the fiber supplement level significantly improved dough consistency. Higher values (greater dough flow per second) indicate lower consistency (softer dough), while lower values reflect firmer dough.

This phenomenon can be attributed to the high fiber and carbohydrate content (e.g., beta-glucan and pectin) in oat bran and apple pomace. The hydrocolloids present bind free water through interactions with proteins, starch, and other flour components, forming a network that enhances dough cohesiveness and consistency [14]. Additionally, extrusion processing likely promotes better water-starch-fiber matrix integration by converting insoluble fibers into soluble fractions with superior water-binding capacity [1,12].

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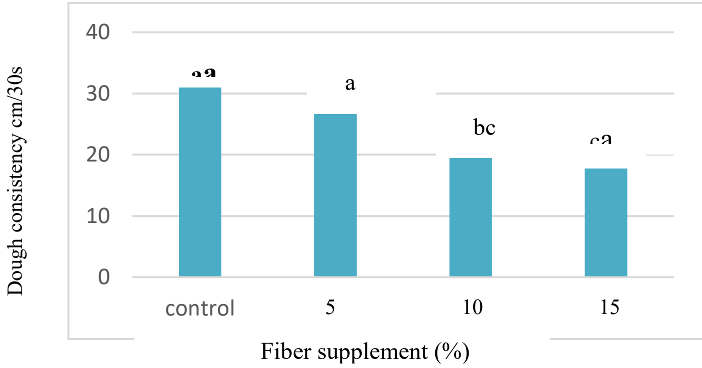

FIG.1. The effect of different treatments on dough consistency

3-3. Effect of Fiber Supplement Type on Cake Moisture Changes

The total water content in food products is an indicator of their shelf life and quality [14]. According to the results in Table 3, analysis of variance (ANOVA) revealed that the addition of textured fiber supplements significantly increased the moisture content of cakes on days 1, 7, and 14 after baking compared to the control sample ($P \leq 0.05$).
This effect can be attributed to the high number of hydroxyl groups present in the fiber structure, which enhances water absorption [15]. Notably, various types of fibers contain free hydroxyl groups that can form hydrogen bonds with water molecules. Additionally, most fibers—such as beta-glucan from oat bran and pectin from apple pomace—exhibit hydrocolloid-like behavior, further improving water absorption in the final product [12].
The network-like structure of fibers allows polysaccharide chains to retain large amounts of water through hydrogen bonding. Alternatively, water may be retained via surface adsorption within the fiber matrix. This functional property enhances moisture content and retention in the product [2,4]. The abundance of hydroxyl groups in gums and fibers increases water absorption by forming hydrogen bonds with water molecules.

TABLE 3. The effect of different fiber supplement treatments on cake moisture during the storage period

Treatment	Moistur/Day1	Moistur/ Day7	Moistur/ Day14
Control	17.45^{a}	14.69^{b}	**12.93 ^{c}**
Fiber supplement (5%)	18.54^{a}	15.57^{b}	**14.67 ^{bc}**
Fiber supplement (10%)	20.83^{a}	17.88^{b}	**14.96 ^{c}**
Fiber supplement (15%)	21.41^{a}	18.90^{b}	**16.58^{c}**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

3-4. The Effect of Fiber Supplement Type on Changes in Cake Porosity

The effective transfer of water is highly dependent on the structure of the food material. An increase or decrease in the water content of the food material can lead to irreversible collapse and changes in porosity. Factors influencing proper water distribution can affect porosity. One of the most important qualitative characteristics of cake is its porous structure, which is formed through the expansion of air bubbles and volume increase during the baking process. The compounds present in the dough affect the stability of the dough during baking,

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consequently influencing the size and number of air bubbles and their distribution in the product's texture [17].

The porosity of fiber-rich products primarily depends on factors such as particle size, shape, and chemical composition of the fibers used. According to the results in Table 4, analysis of variance (ANOVA) indicated that with an increase in the percentage of fibrous supplement substitution (replacing wheat flour), the porosity of all samples significantly decreased compared to the control, with the highest porosity observed in the control sample [1].

The results of Khodadadeh et al. (2018) showed that in all fiber-enriched cake samples—except for the sample containing 15% bagasse fiber powder porosity decreased compared to the control sample. The addition of isomalt to sponge cake formulations also led to reduced porosity in the cake samples [18]. Generally, the substitution of fibrous materials weakens the gluten network, restricts gas cell growth, and causes uneven distribution, leading to reduced porosity, which contributes to increased compactness and firmness of the product [9]. In one study, a decrease in sponge cake porosity was reported with the addition of pineapple fiber [19]. In another study, incorporating pear fiber into cake formulations significantly reduced porosity [16].

TABLE 4. The effect of different fiber supplement treatments on the Porosity of cake

Treatment	Control	Fiber supplement (5%)	Fiber supplement (10%)	Fiber supplement (15%)
Porosity	4.45^{a}	4.13^{ab}	3.93^{ab}	**3.49^{b}**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

3-3. The Effect of Fiber Supplement Type on Cake Moisture Changes

The total water content in food products is an indicator of their shelf life and quality [14]. According to the results in Table 3, analysis of variance (ANOVA) revealed that the addition of textured fiber supplements significantly increased the moisture content of cakes on days 1, 7, and 14 after baking compared to the control sample (P ≤ 0.05).

This effect can be attributed to the high number of hydroxyl groups present in the fiber structure, which enhances water absorption [15]. Notably, various types of fibers contain free hydroxyl groups that can form hydrogen bonds with water molecules. Additionally, most fibers—such as beta-glucan from oat bran and pectin from apple pomace—exhibit hydrocolloid-like behavior, further improving water absorption in the final product [12].

The network-like structure of fibers allows polysaccharide chains to retain large amounts of water through hydrogen bonding. Alternatively, water may be retained via surface adsorption within the fiber matrix. This functional property enhances moisture content and retention in the product [2,4]. The abundance of hydroxyl groups in gums and fibers increases water absorption by forming hydrogen bonds with water molecules.

Sood et al. (2007) found that increasing apple pomace content in cake batter led to higher moisture levels in the final product, which they attributed to the superior water-holding capacity of the fiber in pomace-enriched cakes. Similarly, another study incorporating cocoa fiber in muffin production observed significantly lower moisture content in the control samples compared to fiber-supplemented samples 24 hours after baking. The researchers attributed this difference to cocoa fiber's high water retention capacity [16].

TABLE 5. The effect of different fiber supplement treatments on the Hardness of cake during the storage period

Treatment	Hardness(N) Day1	Hardness(N) Day7	Hardness(N) Day14
Control	3.45^{a}	6.61^{a}	**9.13^{a}**
Fiber supplement (5%)	2.57^{b}	4.59^{c}	**7.37^{b}**

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Fiber supplement (10%)	2.81^{b}	5.78^{b}	**8.11 ^{b}**
Fiber supplement (15%)	3.11^{ab}	6.00^{a}	**9.08^{ab}**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

3-4. The Effect of Fiber Supplement Type on Color Changes in Cake Crumb

Among the physical properties of food materials, color is recognized as the most important visual characteristic in quality perception. Consumers tend to associate color with taste, safety, shelf life, quality, and nutritional properties of food products [2]. According to the results presented in Table 6, the addition of fiber supplements led to a decrease in the lightness of cake samples compared to the control treatment. Among all treatments, the control sample had the highest lightness, followed by the sample containing 5% fiber supplement. Additionally, significant differences were observed between all treatments (p ≤ 0.05).

Furthermore, the results of the variance analysis indicated a significant effect of the given fiber supplement on the redness of the samples. The redness factor (a*) of samples containing fiber supplements increased compared to the control, with the 15% fiber supplement treatment showing the highest redness and the control having the lowest a* value. The yellowness factor (b*) was highest in the control, which can be attributed to the natural yellow color of the oil used in cake production, followed by samples containing 5% fiber supplement. The higher levels of fiber and the presence of more pigments in apple pomace and bran contributed to the increased b* value.

During the baking process, color changes occur in cakes due to Maillard and caramelization reactions, resulting in a brown color in the final product, which indicates a reduction in yellowness. The protein and sugar compounds in oat bran and apple pomace in the cake formulation can influence color intensity. Additionally, the natural pigments in bran contribute to increased darkness and redness in the samples [6, 10, 11].

Moreover, the significant decrease in lightness in fiber-supplemented samples compared to the control (without fiber) can be explained as follows: During baking, as the dough temperature increases, the cake crust loses moisture. At high temperatures, the crust gradually turns brown due to the Maillard browning reaction. Therefore, the amount of sugar, starch, and protein in the product formulation, as well as processing conditions such as temperature and surface moisture loss, affect the intensity of crust darkening [4, 17].

However, the milder changes in lightness, yellowness, and redness in the cake crumb compared to the crust can be justified by the following reasoning: During baking, moisture loss occurs from the inside outward. As temperature rises, moisture content in the outer layer decreases faster, and Maillard reactions proceed more rapidly. This leads to a darker crust color. In the inner parts of the cake, moisture loss is lower, water activity is higher, and the crumb temperature does not exceed 105°C. Under these conditions, Maillard reactions progress slowly, resulting in minimal color changes in the cake crumb [21, 10, 11].

TABLE 6. The effect of different fiber supplement treatments on the color parameters of cake

Treatment	L*	a*	b*
Control	63.81^{a}	2.31^{a}-	**34.47 ^{a}**
Fiber supplement (5%)	61.25^{b}	2.81^{c}	**29.17 ^{b}**
Fiber supplement (10%)	58.79^{b}	4.08^{b}	**28.41 ^{b}**
Fiber supplement (15%)	54.35^{c}	6.24^{a}	**27.88^{a}**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

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3-7. The Effect of Fiber Supplement Type on Organoleptic Properties of Cakes during Storage

The results of the sensory evaluation of adding textured fiber supplements to the cake formulation are presented in Table 7. As shown, the current study reports the overall acceptance score, which is a composite of scores for color, aroma and taste, texture, and mouthfeel of the cake samples.

Based on the mean comparison results, it was found that the textured fiber supplement had a significant effect on the crust color score of the cake. Although increasing the level of the textured fiber supplement reduced crust color, the difference in crust color scores up to the 10% supplementation level was not statistically significant compared to the control. Given the intensification of browning reactions due to the presence of protein and phenolic compounds in samples with higher fiber supplement levels leading to a darker crust color, the decrease in crust color score was expected.

TABLE 7. The effect of different fiber supplement treatments on Total acceptance of cake during storage

Treatment	Total acceptance Day1	Total acceptance Day7	Total acceptance Day14
Control	4.9[a]	4.1[b]	**4 [a]**
Fiber supplement (5%)	4.9[b]	4.5[a]	**4.3 [a]**
Fiber supplement (10%)	4.8[a]	4.4[a]	**4.3 [a]**
Fiber supplement (15%)	3.9[b]	3.6[b]	**3.7[b]**

*Significant at P ≤0.05; ** significant at P ≤0.01; *** significant at P ≤0.001

Regarding crust characteristics (cracking and breakage), crumb graininess, crumb color, aroma, taste, chewability, and crumb texture, the samples containing textured fiber supplements received the highest scores, while the control sample had the lowest scores for these attributes. These findings align with research conducted by Lee et al. (2005) [23]. According to their report, fiber compounds, particularly oats, contribute to a slow and uniform release of CO_2 in the dough, helping retain more gas, increasing porosity, and creating a more symmetrical structure in baked products. Additionally, the presence of active compounds such as certain unsaturated fatty acids and aldehydes in apple pomace and oat bran may explain the improved aroma of the cake samples.

Based on the flavor and aroma scores, as the fiber supplement level increased, the development of apple flavor enhanced the score in this category. Overall, it was found that the control sample and the sample with 10% textured fiber supplement received the highest scores, with sensory panelists rating their overall acceptability as more favorable compared to other samples.

4.Conclusion

Dietary fiber has gained attention as one of the principal components of functional foods over the past half-century. There are diverse sources for producing edible fibers, among which agricultural by-products and processing industries hold significant importance. This is because, in addition to their large-scale production and low cost, they are rich sources of protein, vitamins, dietary fiber, antioxidants, and various micronutrients. According to international statistics, approximately 10 to 50% of agricultural production is discarded annually as waste, exiting the technological cycle.

The results indicate a positive effect of substitution on the chemical, qualitative, and sensory characteristics of the product. The textured fiber supplement was free from microbial contamination, and its application in baked goods formulations can be an effective strategy for producing a new, enriched, and desirable product. The use of extruded fiber sources in cake formulations not only meets consumers' daily fiber requirements and reduces the risk of chronic diseases but also lowers production costs by reducing raw material expenses and extending the shelf life of the cake.

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مقاله علمی_پژوهشی

بررسی تاثیر مکمل فیبری بافت داده شده (تفاله سیب – سبوس جو دوسر) بر ویژگی های فیزیکوشیمیایی وکیفی کیک مافین

الناز میلانی[1*]، مرتضی میرزایی[2]

۱- دکتری جهاددانشگاهی.

۲- کارشناسی ارشد جهاددانشگاهی کاشمر.

اطلاعات مقاله	چکیده
تاریخ های مقاله : **تاریخ دریافت:** ۱۴۰۲/۲/۱۳ **تاریخ پذیرش:** ۱۴۰۲/۵/۱۶ **کلمات کلیدی:** اکستروژن، فیبر، تفاله سیب، سبوس جو دوسر DOI: 10.22034/FSCT.22.163.78. * مسئول مکاتبات:	افزایش تقاضای مصرف فراورده های غذایی با کیفیت و ارزش تغذیه ای بالا، کاربرد فیبرهای رژیمی را به نوعی چالش میان پژوهشگران تبدیل کرده است. در این پژوهش اثر افزودن مکمل فیبری بافت داده شده (اکسترودشده) حاصل از تفاله سیب–سبوس جو دوسر در سطوح ۰، ۵، ۱۰ و ۱۵ درصد، برویژگی های فیزیکوشیمیایی و کیفی کیک مانند رطوبت، قوام، تخلخل، مولفه های رنگ مغز، بیاتی و پذیرش کلی مورد ارزیابی قرارگرفت. نتایج نشان داد که افزودن مکمل بافت داده شده به نمونه‌های کیک تاثیر معنی داری روی پروتئین و چربی آن‌ها نداشته است، اما سبب افزایش درصد رطوبت، فیبر وخاکستر در نمونه‌های کیک گردید. افزودن مکمل فیبری بافت داده شده سبب کاهش میزان سفتی بافت کیک در طول دوره ماندگاری شد؛ به طوری که کمترین میزان سفتی بافت مربوط به نمونه‌های حاوی ۱۰ درصد بود. با بررسی فاکتورهای مربوط به رنگ نمونه‌های کیک مشخص گردید که افزودن مکمل فیبری به نمونه‌های کیک موجب کاهش سفیدی، کاهش فاکتور*b و افزایش فاکتور *a گردید. نتایج ارزیابی حسی نمونه‌ها نشان داد که افزودن مکمل فیبری بافت داده شده تا سطح ۱۰ درصد، سبب افزایش معنی دار امتیاز عطر و طعم، پذیرش کلی گردید$p\leq0.05$. در حالی که قوام و تخلخل خمیر افزایش یافت. نتایج حاصل از این پژوهش نشان داد که مکمل فیبری بافت داده شده، به عنوان فراورده جنبی خط تولید و منبع ارزان و غنی از ترکیبات سلامتی زا می تواند بطور موفقیت آمیزی جایگزین قسمتی از آرد مصرفی برای تولید فراورده های پخت مورد استفاده قرار گیرد. بالاترین مقبولیت شامل کیک غنی شده با ۱۰ ٪ پودر مکمل فیبری بافت داده شده بود.