

Development and Nutritional Evaluation of Date Bran Muffins

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Abstract

Background: Dates, because of their rich nutritional value can be used to develop muffins as value added product with partial replacement of sucrose with date syrup. The objective of this study was to develop high fiber containing product utilizing date syrup and wheat bran as recommended level of fiber is low in our diets.

Method: 7 treatments of date bran muffins for varying concentration of date syrup i.e. 30, 40 and 50% were used with varying amount of wheat bran from 2.5 to 5% by keeping other ingredients constant. These muffins were analyzed for shelf life stability at ambient storage condition for 4 days. Nutritional analysis (moisture, ash, fat, protein, fiber and carbohydrate) was done along with mineral and sensory evaluation.

Results and Conclusions: Sensory evaluation revealed that T₅ (2.5% wheat bran + 50% Date syrup) was best among all treatments. The sensory score of muffins was reduced with the passage of time. Date bran muffins contained 30.3-31.3% moisture, 0.96-1.61% ash, 26.7-27.4% crude fat, 1.3-5.6% crude fiber, 11.4-13% crude protein and 93-20.9% carbohydrate. Increasing concentrations of date syrup in date muffins caused an increasing level of protein, fiber, higher softness and more color development while calorific value decreased by increasing the amount of date syrup.

Keywords: Date; Wheat bran; Muffins; Plant sources

Introduction

Proper use of fiber in diet is an essential requirement for maintaining good health. It helps in reduction of blood insulin and postprandial glucose. Lack of its intake in diet leads to constipation, diverticulosis, cardiovascular diseases and cancer [1].

Generally dietary fiber having high functional properties acting as non-caloric bulking agents, increase water holding and retaining capacities and also enhances oxidation stability. Dietary fibers positively affect structural and physical properties of food, sensory characteristics, texture and shelf-life of product [2]. Soluble dietary fiber is naturally available in food such as fruits, vegetable and can have potential application on dietary fiber supplements [3]. Addition of peach fiber in muffin batter can produce a product with good sensory properties. However, addition of oat and maize dietary fibers in gluten free commodities resulted in higher crumb softness, loaf volume and overall acceptability than non fiber gluten free bread [4].

Dates are rich in natural anti-oxidants (i.e. flavonoids, anthocyanins and phenolic acids) that have the ability to avoid many health problems therefore, used frequently in many nutraceutical food formulations [5,6]. Breads containing the date seeds had higher dietary fiber than wheat bran [1].

In Pakistan, like other countries intake of dietary fiber is not up to the standard and this problem further affected by poorly developed status of food industry especially baking one. As a result of this children have a limited option and remain dependant on snack food that is poor in vital nutrients, hence having poor health and malnutrition [7]. The increases in dietary fiber content can be enhanced by utilization of fruits in bakery products like muffins especially containing mixed fibers. The use of oat bran muffins considerably increases absorption of minerals [8]. Addition of peanuts, cottonseed and soybean flours in muffins increase protein and dietary of muffins without negatively affecting sensory quality [9].

Considering this current scenario and easily availability of dates in Pakistan, as it is the 7th largest producer of good dates in the world [10], an effort was put in to enhance the nutritional value of muffins by increasing their dietary fiber by utilization of dates syrup and wheat bran. The current study will focus on development of date bran muffins. The effect of storage on quality and sensory evaluation of these muffins will also be carried out.

Materials and Methods

Different ingredients such as wheat bran, wheat flour, dates, sucrose (sugar), baking powder, salt, oil, eggs were obtained from local market of Faisalabad, Pakistan.

Preparation of date syrup

Dates were washed and de-pitted. Flesh of dates was boiled with water for 10 minutes to obtain slurry which was blended for 5 minutes and then filtered by using a cloth. The residual pulp was rewashed with adequate amount of hot water then filtered again. Raw juice was centrifuged for 5 minutes at 10,000rpm, followed by concentration using rotary evaporator at 75°C until one third of the total extract volume left. After it syrup was cooked up to 70° brix, filled in sterilized glass bottles and used in muffins recipe at different concentrations [11].

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Recipe of date bran muffin

Flour (250g), baking powder (3g), salt (1g) and sugar (150g) were shifted into bowl and dates syrup (30 to 50 ml) was mixed in it. In another bowl, bran was added with milk (30mL) and gave resting time of 5 minutes, followed by addition of eggs (5) and oil (50ml) and beated well. This mixture was poured into flour batter and stirring was done until the dry ingredients get moistened. Muffin containers were filled two-third with this lumpy batter and baked (Figure 1) at 375°F (190°C) in oven for 30 minutes, or until browned. After that, muffins were removed from oven and cooled by placing them on a wire rack. Muffins were stored at room temperature in polypropylene bags for further analysis.

Analysis of date bran muffins

Proximate analysis: Proximate composition of raw material and date bran muffins were examined and expressed on dry matter basis according to methods such as Moisture method No 44-15 of AOAC (2000), Crude protein method No 46-10 of AOAC (2000), Crude fat method No 30-25 of AOAC (2000), Crude fiber method No 32-10 of AOAC (2000), Ash method No 08-01 of AOAC (2000). NFE was calculated by difference, and energy was calculated using Atwater conversion factors [12].

Mineral estimation: Mineral content of date bran muffins was analyzed by atomic absorption spectrophotometer according to the method described in 40-70 and 40-71 of AOAC (2000) [12].

Shelf life studies of date bran muffins: Shelf life studies were carried out after every 24 hours of intervals i.e. 0, 24, 48, and 72 hours by keeping muffins at room temperature. During these intervals, date bran muffins were evaluated for sensory characteristics and mineral analysis.

Sensory evaluation analysis

Date bran muffins were evaluated for sensory characteristics (such as color of crust, volume, evenness of bake, symmetry of form, character

of crust and internal characteristics like grain, color of crumb, aroma, taste and texture) by a trained panel of judges using score card during storage. The products were scored by the judges according [13].

Statistical analysis

The data recorded will be statistically analyzed using Analysis of Variance Techniques [14].

Results and Discussion

The results obtained from the proximate analysis of the wheat flour, wheat bran and dates are shown in (Table 2). The proximate results of wheat flour were found similar with previous findings [15]. Chemical compositions of dates were found identical with [16] proximate composition of wheat bran find similar from that obtained from literatures [17]. The results of different treatments of date bran muffin for moisture contents are presented in (Figure 1). The moisture content decrease from T_0 (31.32) to T_6 (31.04) because of increasing concentration of date syrup and wheat bran in formulation that condignly increases water holding capacity. The overall effect of moisture within the treatment decreases minutely although the difference is not big. It is observed that moisture content changes during storage. At 0 day moisture contents is high and then there is gradual decrease in moisture content ranged from 32.056 to 30.287. This decrease in moisture content is directly related with temperature of environment as temperature raises moisture content decreases with passage of days. During storage changes in moisture content of different treatments of date bran muffin is in agreement with earlier findings [10] reporting that moisture contents decreases in cereal nuts bar during storage of 15 days at ambient temperature.

The proximate analysis of date bran muffins were showed in the (Table 3). There is an increasing trend in crude protein content from T_0 (11.4) to T_6 (13.01). T_6 containing 50% replacement of date syrup with sugar and high concentration of wheat bran shows higher amount of crude protein. Similar results are reported by earlier researchers [18]. The mean for crude fat values ranged from (26.84) to (26.773) T_6 has lowest value for fat content and T_0 having highest value. The results are found in line with earlier findings [19]. The mean values for ash content showed increasing trend from T_0 (0.96) to T_6 (1.61). The results are in agreement with literature [20]. The mean value of fiber content for T_6 was 5.6% that was higher than T_0 (1.3) So, T_6 had higher fiber content due to high concentration of date syrup and wheat bran. The results are in agreement with literature [20]. Results show that NFE has the highly significant effect among different treatments of date bran muffins. This is due to addition of wheat bran and date syrup. The mean value of NFE for T_0 was 93 which are higher than other treatments. T_6 has lower fiber content due to high concentration of date syrup and wheat bran.

The results of mineral analysis of date bran muffins containing different level of date syrup and wheat bran is shown in (Figure 2) There was increasing trend in calcium, manganese, zinc and iron values from T_0 to T_6 by a range of (108.63 to 111.14 mg/100g), (0.29 to 0.43 mg/100g), (1.39 to 2.37 mg/100g) and (2.37 to 2.99 mg/100g) respectively. Increase in these minerals content from T_0 to T_6 is due to increasing concentration of date syrup and wheat bran which shows a slight but considerable increase in calcium content. These results are in accordance with earlier researchers [21-23] who reported that level of calcium and zinc increased by consumption of oat bran muffins.

Ingredients	Treatments						
	T_0	T_1	T_2	T_3	T_4	T_5	T_6
Wheat bran (gm)	0	2.5	5.0	2.5	5.0	2.5	5.0
Date syrup (mL)	30	30	30	40	40	50	50

Table 1: Treatment plan for date bran muffins.

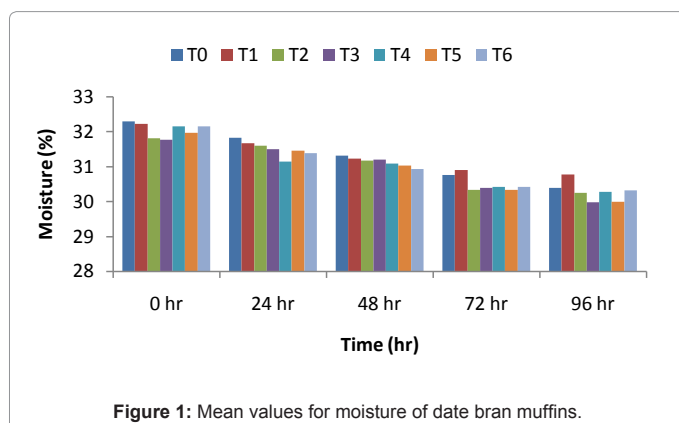


Figure 1: Mean values for moisture of date bran muffins.

Manganese and iron contents increased in date paste during storage of one year.

Color of product is an important criterion regarding the consumer acceptance of Date bran muffins ranging from 3.7 to 5.7 and T₆ obtain maximum score 5.7 and T₃ obtain lowest 3.7 during storage interval of 96 hrs. It is clear from the (Figure 3) color of date bran muffins at 0 hour storage is most suitable (5) as compared with results of 96hrs (4.1) color value decreased due to non-enzymatic browning in product. There is non-significant effect of storage and treatment interaction.

Treatments	Moisture (%)	Protein (%)	Fat (%)	Fiber (%)	Ash (%)	NFE (%)
Flour	12.950	11.40	0.340	0.720	0.850	73.830
Dates	17.403	2.80	1.233	2.433	1.480	74.647
Wheat bran	7.80	17.50	4.080	4.9667	6.633	58.937

Table 2: Proximate composition of raw materials.

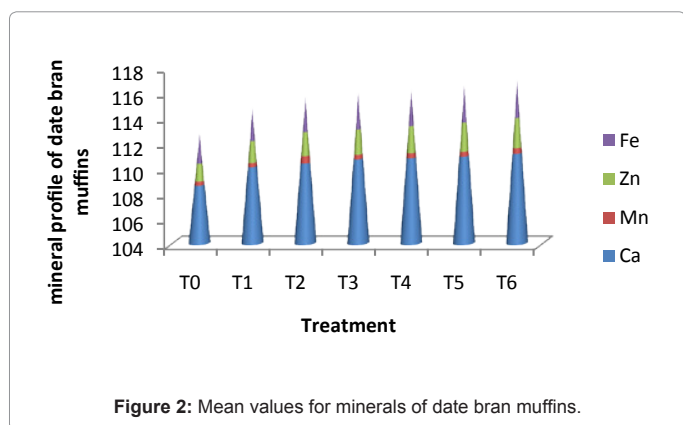


Figure 2: Mean values for minerals of date bran muffins.

Treatments	Mean Values (%)				
	Crude protein	Crude fat	Crude fiber	Ash	NFE
T ₀	11.40	26.84	1.33	0.96	93.07
T ₁	11.5	27.32	4.50	1.10	23.24
T ₂	11.7	27.42	5.36	1.26	22.90
T ₃	12.50	27.52	4.73	1.46	22.27
T ₄	12.55	27.32	5.40	1.53	21.80
T ₅	12.8	27.21	5.43	1.57	21.21
T ₆	13.05	26.77	5.63	1.61	20.97

Table 3: Mean values for proximate of date bran muffins.

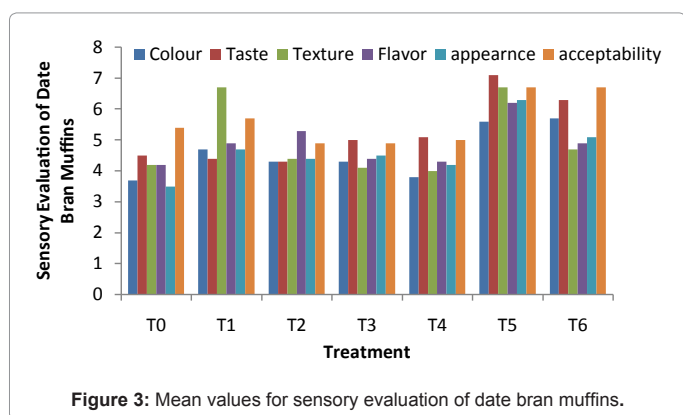


Figure 3: Mean values for sensory evaluation of date bran muffins.

There is highly significant effect of storage on taste of muffins ranged from 4.5 to 6.3 and T₆ obtain maximum score 6.3 and T₂ obtain lowest 4.3 during storage interval of 96 hrs. The reason is that microorganism growth causes staling of date bran muffins.

Texture of muffins ranged from 4.2 to 4.7. There is non-significant effect of storage and treatment interaction. This is due to replacement of sugar with date syrup and different concentrations of bran in recipe. Flavor scores considerably vary among different treatments. Mean values for flavor among treatment ranged from 4.2 to 4.9. Flavor shows significant change during storage ranged from 5.3 to 4.4. This change in flavor occurred by use of varying amount of wheat bran and date syrup and because of some non-enzymatic reactions occurred during storage. Appearance among treatment ranged from 3.4 to 4.6 within treatment and T₅ (5) obtain maximum scores and T₀ (3.5) obtain lowest. Appearance shows significant change during storage ranged from (5.1 to 4.1). Overall acceptability considerably varies among different treatments. Mean values for overall acceptability among treatment ranged from 5.4 to 6.2 which shows that T₅ and T₆ obtain maximum scores 6.7 while T₂ and T₄ obtain lowest score 4.9. Overall acceptability shows significant change during storage ranged from 6.1 to 5. The change in overall acceptability depends on various factors. These results find similar with findings of earlier researchers [20].

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