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The investigation on the effect of rice bran addition on the rheological and sensory properties of muffin cake

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Abstract

Rice bran, one of the main by-products of rice milling industry, has been recognized as an excellent source of protein, dietary fiber and allied micronutrients. Current research was conducted to utilize indigenous rice bran (RB) as well as preparation of value-added products. Rice bran sample, stabilized by oven. In order to determine the effect of full fat stabilized rice bran (in four levels 0, 10, 20 and 30%) on dough rheological and muffin cake sensory properties of one type of wheat flour (with 75% extraction rate) a completely randomized experiment and 3 replications was conducted. The rheological behavior of dough containing rice bran was studied using farinograph. Water absorption, dough development time (30% rice bran) and valorimeteric value were increased and dough stability and dough softening were decreased by addition of rice bran in flour than the control. Sensory evaluation with Friedman test revealed that there is no significant difference between treatments at 5% level (expect the odor). Cakes containing 20% rice bran flour got the highest scores for sensory evaluation (except for the characteristic color). it is concluded that the quantity and quality rheological and sensory properties of paste and muffin cakes was improved with the addition of rice bran flour. Thus rice bran could be used for wheat substituting and a good functional ingredient for value adding of food products. Moreover the present study suggests that T_3 (30% RB + 70% wheat flour) can produce superior quality cakes to prove effectiveness of RB as bakery powder.

Key word: Rice bran, Rheological properties, sensory evalution, paste, muffin cake.

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INTRODUCTION

Rice bran (RB), a nutrient-rich by-product of milling rice, is a soft brown powder comprising about 10% by weight of the paddy rice (Saunders, 1990). Approximately 27.3 million tons of RB are produced annually worldwide (IRRI, 2008). Rice bran consists of 20-29% oil, 10-15% proteins and 20-27% fibers (Pasha et al, 2002). In spite of being plentiful and nutritionally valuable, RB is under-utilized in food product development. Cereals provide more than 70% of the total calories in daily diet in third world countries such as Iran. RB could be a good candidate for supple in wheat flour to enhance the nutritive value and reduce the cost of cereal based food products. Therefore, it is desirable to evaluate the effect of substitution of RB on the rheological behavior of wheat dough and consumers acceptability of bakery products.

The effective utilization of rice bran is possible only by deactivating the lipase enzyme responsible fore the hydrolytic degradation of rice bran constituents (Martin, 1994). Stabilization is an effective treatment turning rice milling by-products into valuable dietary constituents. Nutritional and functional properties of rice bran are well suited for baked products like cookies, muffins, bread, crackers, pastries and pancakes (Barber et al., 1981). Dry heat and extrusion stabilized rice bran was supplemented in wheat flour at 5-20% levels for the preparation of cookies (Sharma and Chauhan, 2002). Inglett et al. (2004) studied a soluble fiber gel production from rice bran and barley flour as a fat replacer in Asian foods. Layer cake at the 40% substitution level showed no statistical difference in taste from the control. Slight taste difference was noted at the 60% level (6.68 compared with 7.59 for the control). However, products with scores higher than 6 are considered suitable when compared with the controls. The present study was undertaken to investigate effects of RB addition on the wheat flour dough characteristics and its final product.

MATERIALS AND METHODS

Sample preparation

All experiment were conducted with bran milled from the rice variety *Hashemi*. Freshly milled rice bran was obtained from a local milling factory (Lahijan, Iran). The bran was immediately stabilized using oven heating (110°C for 10 minutes). Immediately subsequent to heating, the sample was removed from the oven, cooled to room temperature (25°C). The stabilized rice bran was milled into flour. The flours were screened through a 30 mesh sieve before supplementation with wheat flour. Whet flour (with 75% extraction rate) and remaining ingredients for products preparation were purchased from the local market.

Analysis of rice bran supplemented flours

Dough rheological studies

Dough rheological properties are important for the preparation of quality muffin cake due to their significant effect on final cake volume. The rheological behavior of rice bran supplemented flours was evaluted by conducting farinographic studies before the preparation of product as described below:

The rheological behavior of rice bran supplemented flours was evaluated by running samples through a brabender farinograph (Brabender Duisburg 380, Germany) equipped with 50g bowl capasity to assess the dough behavior of each sample (AACC, 2000). The farinograms were interpreted for the characteristics such as water absorption, dough development time and dough stability.

Preparation of rice bran supplemented muffin cakes

Cakes were prepared from blends containing 0%, 10%, 20% and 30% of rice bran flour. The formula included 1000 g flour blend, 850g sugar, 400 g whole egg, 250 g shortening, 40 g baking powder, 16 g salt; 900 g skimmed milk and 17 g vanilla (purchased from the local market, Lahijan. Iran). Also, 75 mL tap water (21°C) were added with increasing of rice bran

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flour. Cake batter was prepared using a mixer (Moulinex, France) with a rotary speed of 220 r.p.m. Cake batter (400 g) was poured into an cake pan and baked at 177°C for 35 min in a thermostatically-controlled oven with air fan. Upon cooling, the weight of each cake was recorded and the cake was wrapped tightly in a plastic food wrap and stored at room temperature for testing.

Analysis of rice bran supplemented muffin cakes

Sensory evalution

Muffins cakes were baked under standard condition and kept for 48 hours at room temperature and using a five-point hedonic scale for six attributes (Appearance, taste, color, odour, texture and overall acceptability) where five is like extremely and one dislile extremely, according to Hegazy & Faheid (1990) by 30 staff members of the Food Science Dept., Islamic Azad University, Quchan Branch, Iran.

Statistical analysis

All tests were conducted in triplicate and were analysed by one-way analysis of variance and least significant difference (L.S.D) at .05 level according to the method described by McClave & Benson (1991). The sensory data were analyzed with Friedman test with statiistical software program SPSS, ver. 14.0, windows. Data were presented as mean ± SD and 3 replications in a table.

RESULTS AND DISCUSSION

Farinograph characteristics of wheat flour-RB dough

Data presented in (Table 1) show the effect of adding RB at four levels on the rheological properties of dough as evaluated by a faringraph. As shown in table 1, water absorption increased as rice bran level increased. This increase is due to the high fiber content of rice bran. Fiber is characterised by its high water holding capacity as reported by Holloway & Grieg (1984). Also, Sudha et al. (2007) pointed out that water absorption and arrival time increased as stabilized rice bran level increased in dough. The table data can be concluded that increasing the percentage of stabilized rice bran cake flour, the dough development index range from 3 to 9/4 that the flour with the consistency of the medium to produce is cake. This increase in dough development increased and sustained levels of high-fat bran by removing fat, according to research results Sudha et al. (2007).

The difference in the effect of fiber on dough development time can be interactions between the fiber and protein, wheat gluten explained. D′Appolona and V.L. Youngs (1978) the effect of adding oat bran dough faringraph characteristics, showed that development time is reduced by adding bran.

Dough stability, which indicates the dough strength, is the difference between arrival and departure time. It is obvious from the results (Table 1) that dough stability time ranged from to 4.5 min among different treatments. The highest value (4.5 min) was observed in T_0. The time interval in minutes from addition of water to the point of maximum consistency, before start of weakening process, is recorded as dough development time (min). Means for dough development time (min) of rice bran supplemented flour samples (T_0, T_1, T_2, T_3) showed highly significant variations among the treatments. The highest dough development time (4.7 min) was observed in T_3. There was increase in dough development time, with increased levels of stabilized fullfat (T_3). Present results are consistent with previous findings of Kailasapathy and MacNeil (1985) who observed an increase in peak time with an increase in winged bean flour in wheat flour. Samples containing 30 percent bran has the highest value, which indicates the strength volorimetery paste this treatment compared to other treatments. The same conclusion in a study to examine the effect of adding psyllium husk was found to account for bakery flour. It should be noted that increasing the number volorimeteriy, reason is on improving the properties of dough rheology.

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Table1. Mean squares for farinographic characteristics of supplemented flours[a]

Level of rice bran	Water absorption (%)	Dough development time (min)	Dough softening after 10 min (BU)	Dough stability (min)	volorimetery value (BU)
Control	59.2±.625[a]	3.4±.133[a]	53±.375a	4.5±.176[a]	48±.459[a]
10%	63.5±1.274[abc]	3.2±.1[ab]	53±.434[a]	4.3±.05[a]	47±.722[ab]
20%	67.4±.133[bc]	3.±056[b]	52.5±.999[ab]	4.1±.076[a]	48.5±.167[b]
30%	69±.434[c]	4.7±.139[c]	51±1.342[b]	4.2±.16[a]	49±.076[a]
LSD	5.678	.02	1.871	-	.821

[a]Value are means ± standard deviations (n=3)
 *Valus within a column with different superscripts are significantly different ($p < 0.05$).

Sensory evalution

Figure 1 presents the scores of the four orepared cakes for appearance, color, odour, taste, texture and overall acceptability.The treatments listed in prepared from control and 20 percent bran has a better appearance, better color control samples prepared from samples of 20% rice bran flavor, texture, and are more accepting. The sensory evaluation results of the outcome, it comes back to replace that of rice bran on sensory quality in comparison with control cake produced no significant impact (except for the smell factor) and this is matches the results obtained by Inglett, G et al. (2004) on the Layer cake. They studied a soluble fibre gel produced from rice bran and barley flour as a fat replacer in Asian foods. Layer cake at the 40% substitution level showed no statistical difference difference in taste from the control. In this study, adding 20% rice bran to wheat flour, It had an good impact on quality of the muffin cakes. And except for the color, even a higher score than the control has achieved.
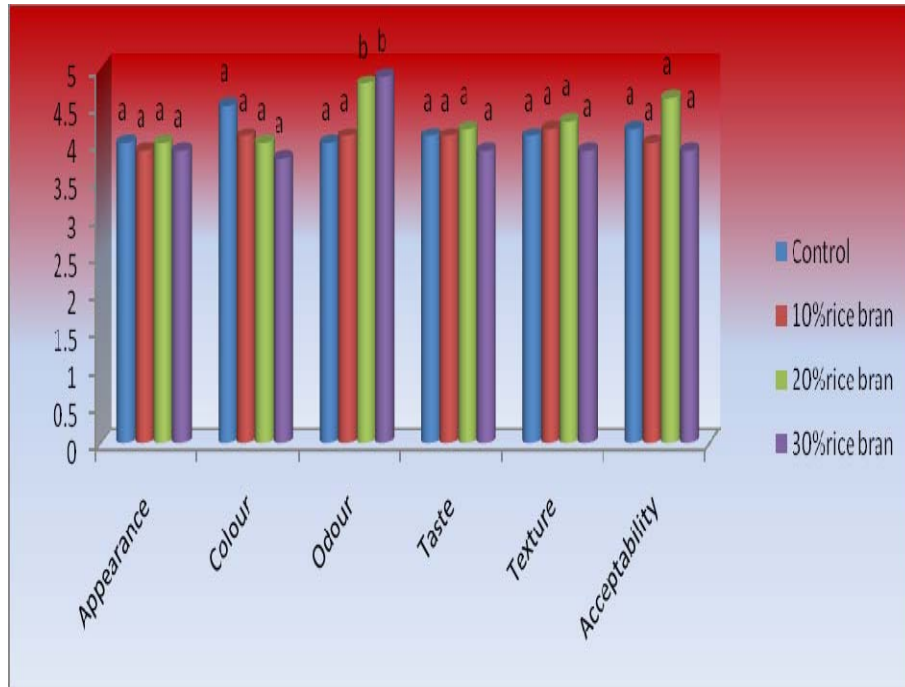
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FIGURE 1. Effect of RB replacement on sensory evalution of prepared cakes
(values were with different superscripts are significantly different at $p < 0.05$).

CONCLUTION

This study revealed that rheological properties and sensory evalution (expect the odor) of cakes prepared with 30% and 20% rice bran flour were more acceptable and had no adverse effect on quality compared to the contorol cakes. Addition of stabilized RB to wheat flour generally impacts the mixture positively, resulting in higher water absorption capacity and inferior performances in dough stability. Nevertheless, our results indicate that the physico-rheological properties of the RB added flour mixtures were not significantly different from those of control wheat. It is evident that rice bran could be useful for preparation of functional food of potential application for those suffering from hyperlipidemia. The findings of this trial highlight the beneficial effect of rice bran on human health.

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