

Evaluation of the Effect of Carboxy Methyl Cellulose on Sensory Properties of Gluten-Free Cake

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Abstract: Cakes prepared from wheat flour are not appropriate for people suffering from celiac disease due to sensitivity to gluten. Therefore cakes prepared from rice flour lacking gluten are produced for these individuals. In this study in order to produce gluten-free cakes, rice flour combined with Carboxy Methyl Cellulose (CMC) at two concentrations of 0.25 and 0.75% were used. A rice cake lacking gum was regarded as control. At first, chemical test measuring moisture, protein, ash, fat and pH were performed. Then rice cakes (containing gum and lacking gum) were produced through semi-industrial method followed by sensory evaluation in terms of uniformity, crust property, rupture, aroma, taste and flavor. Sensory analysis by panelists showed that addition of CMC gum at two concentrations to bread formulation led to improvement of sensory properties. In other words rice cakes containing CMC had better sensory properties than control rice cakes (lacking gum). In addition of among gum-containing treatments, the sample with 0.75% gum had better scores than the other one.

Keywords: Carboxy methyl cellulose, celiac, gluten free cake

INTRODUCTION

Celiac disease is caused due to consumption of grains such as wheat, rye and barely which contain gluten. Sensitivity of some individuals to gluten leads to occurrence of this disease which in turn causes a disorder at food digestibility, atrophy and even death. In order to inhibit celiac disease, a diet lacking gluten such as rice should be used (Kupper, 2005). However gluten-free cakes prepared from rice flour don't contain appropriate sensory properties due to absence of gluten and consequent gluten network in rice flour. This problem can be solved by incorporation of some gums at cake formulation. Gums are polysaccharides of high molecular weight used at food systems to control viscosity (Stuffer, 1990). CMC is a functional gum composed of β -glucopyranose (1 \rightarrow 4) units. It is a white-creamy linear, ionic, synthetic and water-suspend able molecule having no smell and can't be fermented. In recent years CMC has replaced with starch and water soluble substances such as Sodium alginate and gelatin due to economic reasons (Asghar and Anjum, 2005). Evaluating the effect of different gums such as Pectin, HPMC, Guar and Xanthan on quality and shelf life of yellow cakes, Gomez *et al.* (2005) showed that all the said gums except pectin improved quality and sensory properties of cake samples. They also reported that gum addition caused an increase in volume and decrease in staling rate (Gomez *et al.*, 2005). Guarda *et al.* (2004)

found that use of HPMC improved sensory properties such as appearance, smell taste, crispiness and acceptability of bread samples (Guarda *et al.*, 2004). The aim of this study is the effect of Carboxy Methyl Cellulose (CMC) at two concentrations of 0.25 and 0.75% on Sensory properties of Gluten-Free Cake.

MATERIALS AND METHODS

Rice flour (Sahar bread Co.), sugar powder (hadan Co), baking powder (Bahareh Co.), salt (Golbahar Co.), margarine (Nastaran Co.), egg (Telavang Co.), acetic acid and calcium propionate (Novin petro pars Co.) and CMC gum (Dowchemical Co.) were obtained to prepare rice cake. In all tests, control treatment was signified with C code, treatment containing 0.25% CMC was signified with C1 code and treatment containing 0.75% CMC was signified with C2 code. The experimental has been done in Islamic Azad University of Varamin in 2011.

Chemical tests of rice flour: Chemical tests on rice flour with three replication measured moisture (AACC 44-10), ash (AACC 08-01), protein (AACC 46-12), fat (AACC 30-10) and pH (AACC 02-52) (Anon, 2003).

Preparation method and baking procedure of rice cakes: Raw materials including rice flour, margarine, sugar powder, salt, baking powder, calcium propionate,

Table 1: Chemical properties of rice flour

Flour	Moisture%	Ash%	Fat %	Protien%	PH
Rice flour	8.7	0.47	0.88	9.48	5.3

Table 2: Comparison of sensory tests on samples containing gum and control

Treatment	Taste	Aroma	Rupture	Crust	Uniformity	Texture
C ₁	6.33 ^a	7.33 ^a	2 ^a	2 ^a	2 ^a	11.33 ^a
C ₂	7.33 ^b	7.33 ^a	2 ^a	2 ^a	2 ^a	12.33 ^b
C	4.33 ^c	4.33 ^b	1 ^b	1 ^b	1 ^b	8.33 ^c

In each column mean that at least 1 letter in common, according to Duncan's test not significant at 1% level

acetic acid and CMC gum were prepared and weighted. Rice flour, salt, baking powder, CMC and calcium propionate were then sieved three times followed by mixing margarine and sugar powder at two time intervals. Water was added to the mixer gradually and the mixture was exposed to an additional stirring. The obtained dough was transferred into desired molds followed by baking at 200°C for 60 min. The obtained cakes were removed from the molds, cooled at room temperature, packed with polypropylene bags and stored at room temperature for subsequent analysis (Ashwini *et al.*, 2009).

Evaluating sensory properties of prepared cakes: In order to evaluate sensory properties five senses were used. In this regard cake samples were cooled, cut, coded and tasted by some trained assessors. Evaluation was based on external (volume, crust color, shape fitness) and internal (crumb color, chewiness, texture, etc.) properties of the cake samples panelists gave certain scores to each property (Turabi *et al.*, 2010).

Statistical analysis: Statistical descriptive properties were analyzed using analysis of variance. Also statistical analysis of data was performed with the use of SAS software followed by Duncan's multiple range tests.

RESULTS AND DISCUSSION

Table 1 show results obtained from chemical tests on rice flour and Table 2 indicates results related to mean comparison of sensory properties test of cakes.

As you can see from Table 2, gum addition improved uniformity of the obtained cake compared with control and there was a significant difference between gum containing treatments and control one. These results are in accordance with findings of Rosell *et al.* (2001). Based on Table 2 addition of CMC at two concentrations led to improvement of cake's crust compared with control. Furthermore a significant difference was observed between gum-containing treatments and control treatment. These results are in line with those of Guarda *et al.* (2004). Also Table 2 shows that gum addition improved rupture compared

with control sample; In other words samples containing gum had more resistance to fracture and rupture than control one due to presence of gum and consequently firm bonds in formulation. These results agree with findings of Shalini and Laximi (2007). In addition incorporation of CMC gum at cake's formulation enhanced aroma compared with control (significant difference). This is due to neutral flavor and aroma at gum's structure. The results obtained in this study are in accordance with findings of Rosell *et al.* (2001) who reported that aroma was increased by gum addition (Rosell *et al.*, 2001). Use of CMC gum improved taste of the obtained cakes compared with control (significant difference) (Rosell *et al.*, 2001) have obtained the same result (Rosell *et al.*, 2001). Finally similar observations were obtained for texture; in other words CMC gum addition led to improvement of cake's texture. These results are in agreement with findings of Shalini and Laximi (2007).

CONCLUSION

In the present study rice cakes were prepared through semi-industrial method using CMC gums at two concentrations of 0.25 and 0.75%, respectively. Sensory analysis by panelists showed that CMC gum addition improved all sensory properties compared with control sample.

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