USE OF VARIOUS STARCHES IN MICROWAVE BAKED CAKES

DEĞİŞİK NİŞASTALARIN MİKRODALGA İLE PİŞİRİLMİŞ KEKLERDE KULLANIMI

Gülüm ŞÜMNÜ
M.E.T.U Food Engineering Department 06531 ANKARA

ABSTRACT: The effects of wheat, rice and corn starch on the quality of microwave baked cakes were investigated. Starches were added to the cake formulation at concentratiions of 2.5 %, 5.0% and 7.5% (flour weight basis). No starch was added to control cakes. Cakes were baked in the microwave oven at 100% power for 8 minutes. Weight loss, volume index and uniformity index of cakes were determined. Wheat starch was found be the most efficient starch in affecting the change of weight loss, volume index and uniformity index. No statistical significant difference was determined between different starch concentrations.

ÖZET: Buğday, pirinç ve mısır nişastalarının mikrodalga ile pişirilen kek kalitesi üzerine etkisi araştırılmıştır. Nişastalar kek karışımına %2,5, %5,0 ve %7,5 konsantrasyonunda eklenmiştir (un ağırlığı bazında). Kontrol keklerine nişasta eklenmemiştir. Kekler mikrodalga fırında %100 güçte ve 8 dakika boyunca pişirilmiştir. Keklerin ağırlık kaybı, hacim indeksi ve düzgünlük indeksi ölçülmüştür. Buğday nişastası ağırlık kaybı, hacim indeksi ve düzgünlük indeksini etkileyen en etkili nişasta olarak bulunmuştur. Değişik nişasta konsantrasyonları arasında istatistiksel açıdan önemli bir fark bulunmamıştır.

INTRODUCTION:

Microwave cakes are continuing to gain popularity. It is a challenge of food technologists to improve the quality of microwavaeble cakes. Main problems in microwave cakes are reduced cake height, dense or gummy texture (BELL and STEINKE, 1991). Many consumers have the perception that microwave baked products are less moist than conventionally baked products.

Studies showing the moisture loss changes occuring during microwave baking is limited. Weight loss of cakes during microwave baking which is an index of moisture loss was found to be greater than weight loss of cakes during conventional baking (EVANS, 1982; LAMBERT et al., 1992; CAPP, 1993, ŞÜMNÜ, 1997). Relatively large amounts of interior heating creates significant interior pressure and concentration gradients which increase the flow of liquid through the food material to the boundary. Therefore, foods that are heated in microwave oven lose more water than conventional heating (DATTA, 1990).

Gums are added in cake formulas to increase the stability of moisture and to improve the texture of the finished cake (BELL and STEINKE, 1991). Methyl celullose was shown improve moisture retention of cakes significantly (BELL and STEINKE, 1991). Starches with different water absorption properties can be used in different bakery products to hold onto moisture during the baking process thus increasing moisture retention (ZALLIE, 1988). The main objective of the study was to determine effects of starch addition on the reduction of the weight loss of cakes during microwave baking. Volume and the uniformity indexes of the microwave baked cakes were also determined.

MATERIALS AND METHODS

Cake formulation was: 100% flour, 125% water, 100% sugar, 12% milk powder, 3% salt, 5% baking powder, 5% egg white, 45% shortening. Concentrations are based on flour weight. Wheat, rice and cornstarches were added to the cake recipe at concentrations of 2.5%, 5.0% and 7.5% (flour weight basis). No starch was added to control cakes.

A modified mixing procedure was used to prepare cake formulations All dry ingredients (except sugar) were combined and sifted well. Shortening was melted and mixed with egg white . Then sugar was added and mixed at medium speed .The dry ingredients were added alternatively with water and mixed at medium speed until a homogenous mixture was obtained.

Cake batter (375 g) was transferred to a greased glass baking pan, Cake batters were then placed in the center of the carousel type microwave oven (Vestel Goldstar). Microwave power of the oven was determined as 175 W by IMPI method (BUFFLER, 1993). Cakes were baked in the microwavei oven for 8 minutes at 100% power.

Weight loss of cakes as an index of moisture loss was measured by determining the initial weight of the pan and batter as well as the weight of baked cakes immediately after removal from the oven. Cake volume index and uniformity index were determined by AACC template method 10-91 (AACC, 1983).

Analysis of variance was conducted on a full factorial design with 3 starch types, 3 starch concentrations and the control. Treatment means were compared by using Duncan's Multiple Range test ($p \leq 0.05$).

RESULTS AND DISCUSSION

Weight loss can be considered as an index of moisture loss. Wheat and rice starches were found to be more efficient than corn starch in reduction of weight loss of cakes (Figure 1). This is an expected result since water binding capacity of rice and wheat starches were shown to be greater than corn starch (CAPP, 1993). The high water absorption values of these starches would account for much control on moisture migration, which is reflected to the weight loss values of cakes. Therefore, wheat starch or rice starch can be added to the cake formula to increase moisture retention during microwave baking. No significant difference was determined between corn starch added cakes and control cakes. Weight loss was not significantly affected by any of the starch concenrations.

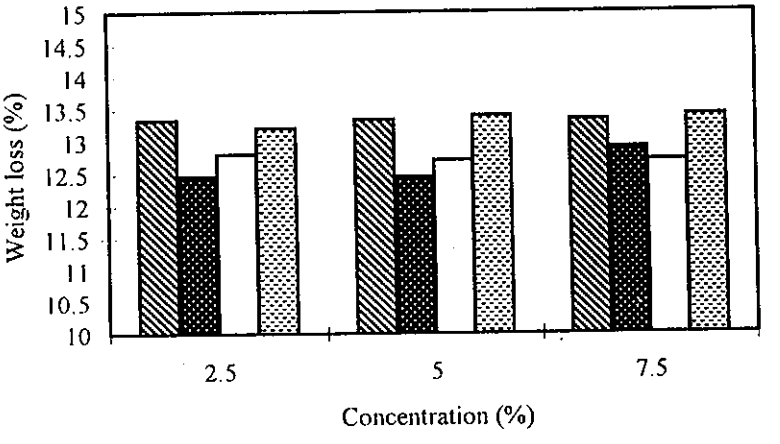

Figure 1. Effects of starches on weight loss of microvave-baked cakes (■) : Control[a*], (▨): wheat starch[b], (□): rice starch[b] (▨): corn starch[a]
***starches with different letters (a,b) are significantly different ($p \leq 0.05$)**

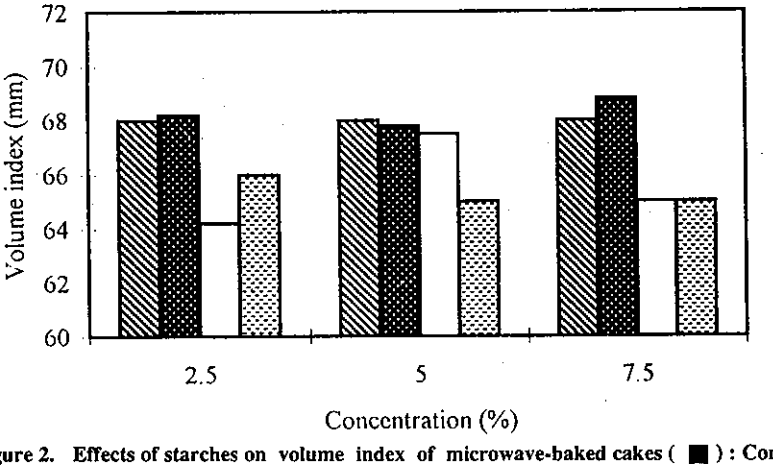

Figure 2. Effects of starches on volume index of microwave-baked cakes (■) : Control[a*], (▨): wheat starch[a], (□): rice starch[b], (▨): corn starch[b]
***starches with different letters (a,b) are significantly different ($p \leq 0.05$)**

The measurement of volume is a valuable tool in the evaluation of cake quality not only it contributes to visaul appeal but also it serves as an indicator of the structural development (CLOKE et al., 1984). The effects of starches on the volume index of microwave cakes can be seen in Figure 2. As can be seen in the figure, addition of rice starch and corn starch to the cake formula reduced volume index of microwave cakes. Usage of wheat starch neither increased nor decreased the volume index of microwave cakes. It was previously observed that cakes formulated with wheat starch had higher volume than rice starch and corn starch cakes (ŞÜMNÜ, 1997). No significant effects of starch concentrations were seen on affecting the volume index of cakes.

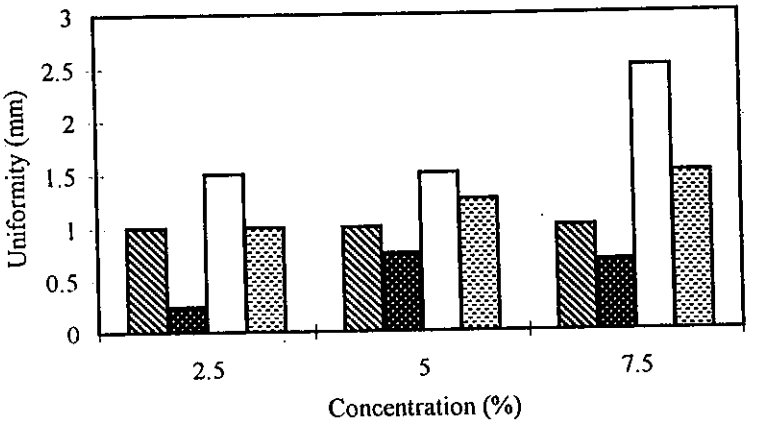

Figure 3. Effects of starches on uniformity index of microwave-baked cakes (■): Control[b*], (▩) wheat starch[c], (□): rice starch[a], (▨): corn starch[b]
***starches with different letters (a, b) are significantly different (p≤ 0.05)**

The uniformity index is used as a measure of cake symnetry. For the optimum cake this index is used as a measure of cake symmetry. For the optimum cake this index should be zero because positive or negative values occur when one side of the cake is higher than the other (CLOKE et al., 1984). Cakes contaiening wheat starch are more uniform than control cakes as can be seen from their low uniformity index values (Figure 3). Rice starch reduced the uniformity of cakes Starch concentrations do not have any statistically significant effect on the uniformity index.

CONCLUSIONS

Both wheat starch and rice starch addition reduced the weight loss of microwave baked cakes significantly as compared to control cakes. However, addition of rice starch had the disadvantage of reducing the volume and uniformity of cakes. As a results, it is advisable to use wheat starch in microwave cakes where moisture loss needs to be avoided and uniformity needs to be increased.

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