

## Evaluating chemical properties of all bread types in Hamedan bakeries

<sup>1</sup>Sari, A.A., <sup>1\*</sup>Bazargani-Gilani, B., <sup>1</sup>Pajohi-Alamooti, M.R. and <sup>2</sup>Choobkar, N.

<sup>1</sup>College of Veterinary Science, Bu-Ali Sina University, Hamedan, Iran

<sup>2</sup>Kermanshah branch, Islamic Azad University, Kermanshah, Iran

### Article history

Received: 10 June 2016

Received in revised form:

26 July 2016

Accepted: 1 September 2016

### Abstract

Bread is extensively used in Iran and has an important role in people's nutrition and public health. Some bakeries are using baking soda (sodium bicarbonate) and extra salt in bread production. In this regard, evaluation of produced bread in terms of baking soda and quantity of used salt is critical. This descriptive cross-sectional study was carried out in 92 bakeries in 2014, Hamedan, Iran. The salt percentage and pH of samples were tested based on Institute of Standard and Industrial Research No. 2628. Results showed a mean pH of  $6.14 \pm 0.6$ ,  $6.6 \pm 0.19$ ,  $6.44 \pm 0.07$  and  $5.94 \pm 0.79$  for Lavash, Sangak, Taftoon and Fantezy bread, respectively. The mean values of salt percentage were  $1.21 \pm 0.56$ ,  $0.32 \pm 0.17$ ,  $1.94 \pm 0.17$  and  $1.67 \pm 0.49$  for Lavash, Sangak, Taftoon and Fantezy bread, respectively. In our study, except for Fantezy bread, The mean pH values of Sangak, Lavash and Taftoon were higher than the standard value. The mean salt percentage of all bread types were in the normal range.

### Keywords

Bread

Baking soda

Salt

Hamedan

© All Rights Reserved

### Introduction

As an important nutritional source, bread has a special importance all over the world, supplying some of our daily energy requirements, proteins, minerals and B vitamins. Iranians receive about 60-65% of their protein and calorie and also about 2-3 g of their daily mineral requirements from bread (Sani, 1998; Rajabzadeh, 2001). The main ingredients of bread include wheat flour, water, salt, yeast or sourdough yeast; these materials have to get the certificate of Iranian National Standard Organization (Standard No.2628).

Unfortunately, most of the bakeries use some chemicals such as baking soda (sodium bicarbonate) or blankit (sodium hydro sulfite) to accelerate baking process and cover its imperfections due to unnatural fermentation, unpleasant wheat quality or unpleasant appearance (Mosaddegh *et al.*, 2014). On the other hand, high quantities of salt may be used to improve the resistance of dough, made of low quality wheat flour (Malakootian *et al.*, 2005). Further studies showed that the consumption of more than 100 mmol/day salt increases the risk of cardiovascular diseases by 24%; so, its consumption has to be controlled in the human diet (Fox, 1995; Yarmard, 2009; Zibaenezhad *et al.*, 2010). Lack of the sourdough yeast in bread preparation yields acid phytic residues in bread that is combined with calcium and finally disrupts calcium absorption in human body (Faridi

and Rubenthaler, 1983; Mahan and Escott-Stumm, 2008).

Baking soda is heat-resistant so it will remain in baked bread and leads to the pH increase, making alkaline taste and the dough volumous (Rajabzadeh, 2001). Studies showed that the increase of pH, decreases the absorption of the bivalent minerals such as iron, calcium, manganese, copper, vitamin C and B1. Decrease of these important minerals and nutrients, especially in pregnant women and children is a public health threat (Jahed Khaniki *et al.*, 2007; Mahan and Escott-Stumm, 2008).

Furthermore, high consumption of the baking soda will lead to the decrease of potassium, increase of sodium (hypernatremia), blood pressure, metabolic alkalosis, calcium excretion from kidney and even hypocalcemia (Geissler and Powers, 2005; Chamandoosta *et al.*, 2015). Considering this fact that bread is one of the most important part of daily meals, this study aimed at measuring bread 's chemical properties in Hamedan city.

### Material and Methods

#### Sampling

This descriptive cross-sectional study was carried out in 92 bakeries of Hamedan city in October- December of 2014. Samples included 46 Lavash, 22 Sangak, 16 Fantezy and 8 Tafton breads. For collecting each sample, 3 bread loaves were

\*Corresponding author.

Email: [behnazbazargani90@gmail.com](mailto:behnazbazargani90@gmail.com)

Table 1. Average pH of different bread types in Hamedan

pH Bread type	No. of samples	Min	Max	Mean±SD	No. of samples with pH more than 6 (%)	Standard pH
Lavash	46	5.05	6.99	6.14±0.6 <sup>b</sup>	26 (56.52)	5-6
Sangak	22	6.17	6.85	6.6±0.19 <sup>a</sup>	22 (100)	4.6-5.6
Tafton	8	6.35	6.52	6.44±0.07 <sup>ab</sup>	8 (100)	5-6
Fantezy	16	4.93	7.10	5.94±0.79 <sup>bc</sup>	6 (37.5)	5-6

<sup>a,b,c</sup> Means followed by a different letter within the same column are significantly different (p<0.05).

randomly taken from the middle products of each bakery and considered as one sample. Samples were sent to the food quality control laboratory and dried at room temperature. Salt amount and the existence of baking soda were evaluated in each sample according to Iran, 's Standard and Industrial Research Institute ( Protocol No.2628).

#### *PH evaluation*

For pH evaluation, 10 g of homogenized sample was weighted in a 250 cc flask and then 90 cc of neutral distilled water was added and shaken for 15 min alternatively. Then, its pH was measured by digital pH meter (Coming Co, USA) that was calibrated by standard buffer solutions (pH=4, pH=7, pH=12).

#### *Salt measurement*

In order to measure salt quantities in bread samples, first the samples were ground and then 1g of them was weighted and taken. Then ground samples were poured into a 250 cc flask; then, 10 cc of 0.1 N silver nitrate and 10 cc of concentrated nitric acid were added and the mixtures were boiled. Next, 5 cc of saturated potassium permanganate solution was added to the boiling solution until it became colorless. When the solution was cooled, 100 cc water and 5 cc ferric ammonium sulfate were added and it was titrated by 0.1N ammonium thiocyanate solution until its brownish red color disappeared and became stable for 15 s. Salt quantity was obtained from the following formula:

$$\text{Salt (\%)} = \left( \frac{\text{amount of silver nitrate (0.1 N)}}{\text{amount of ammonium thiocyanate (0.1 N)}} \right) \times 0.585$$

#### **Results**

This study showed that from 92 samples, 62 samples (67.39%) had a pH of over 6 and the highest ones were reported from traditional bakeries. Furthermore, 26 samples of Lavash bread (56.5%) and all of the Tafton and Sangak bread samples

(100%) had higher pH level than the standard limit. While in Industrial bread, there were only 6 samples (37.5%) with a pH more than 6. According to the results, Sangak significantly (p<0.05) being the highest at pH value that followed by Tafton, Lavash and Fantezy samples (Table 1).

The maximum acceptable salt according to food standard No. 2826 is 2%; so, there were 20 (21.73%) samples of all bread samples with unstandard salt quantity. In this study, most samples with high salt quantity belonged to Tafton bread; as from 8 bread loaves, 6 samples (75%) had higher salt quantity than the acceptable limit. In Fantezy and Lavash breads, 50% and 13.04% of the samples had higher salt quantity than the standard limit; but, the mean salt percentage of all Sangak samples were in the normal range. The highest salt content significantly (p<0.05) was seen in Tafton that followed by Fantezy, Lavash and Sangak samples (Table 2).

#### **Discussion**

Bread is one of the mostly consumed foods in Iran. According to its high daily consumption per capita (314-505 g per day), its quality evaluation has an important role in public health (Ghanbari and Farmani, 2013; Arastia *et al.*, 2014; Iranshani *et al.*, 2014). This study aimed to evaluate produced breads 'quality in Hamedan. Results showed that pH of Lavash bread (56.52%) was more than 6. All of evaluated Sangak and Tafton breads had higher pH than the standard limit while in industrial breads, only 37.5% of all samples had higher than standard use of baking soda. These results showed that traditional bakeries use baking soda at high levels.

Kamani *et al.* (2008) has evaluated, baked bread in Zahedan. They found that 82 bakeries (37.3%) produce breads by adding baking soda. They reported that average pH was about 5.93±0.34 and Lavash was the bread with the maximum addition of baking soda (60%). In another study salt and pH of different types of breads were evaluated in Kerman. Results showed that there was a widespread use of baking soda in this

Table 2. Average salt content (%) of different breads in Hamedan

Bread type	No. of samples	Salt quantity (%)		Mean $\pm$ standard deviation	No. of samples with higher salt content	Stand: limit
		Min	Max			
Lavash	46	0.29	2.35	1.21 $\pm$ 0.56 <sup>c</sup>	6 (13.04)	2
Sangak	22	0.11	0.6	0.32 $\pm$ 0.17 <sup>d</sup>	0 (0.0)	2
Tafton	8	1.75	2.11	1.94 $\pm$ 0.17 <sup>a</sup>	6 (75)	2
Fantezy	16	1.11	2.27	1.67 $\pm$ 0.49 <sup>b</sup>	8 (50)	2

<sup>a,b,c</sup> Means followed by a different letter within the same column are significantly different (p<0.05).

city and only 24.2% of the Kerman bakeries were in hygienic conditions (Malakootian *et al.*, 2005).

Salt evaluation of produced breads in Hamedan bakeries showed that 50% of Fantezy, 75% of Tafton and 13.04% of Lavash breads had the higher than standard salt content (>2%). Maximum use of salt in these breads were about 2.35% that is almost compatible to Iranian National Standard Organization; it means that different types of breads are in good conditions regarding salt quantity. Evaluation of salt and baking soda by Malakootian and Dolatshahi (2007) in Jiroft showed that average pH in machinery Tafton, Oven Tafton, Fantezy and Sangak breads was about 5.78. They reported that 9.5% of machinery Tafton bakeries use baking soda but many others don't. They also reported that the salt quantity in these breads was about 2.38%.

Zabihollahi *et al.* (2013) evaluated the quantity of used salt and baking soda in Kordestan bakeries. They found that the average pH in all samples including Lavash, Sangak and Barbari was 6.01 $\pm$ 0.32 and average salt use was 2.19 $\pm$ 0.26. The salt quantity in bread was a little higher than standard level in this study. In another study, Rostami and Farajzadeh (2013) evaluated pH in Lavash breads provided in military garrisons and reported that their pH was 6.17 $\pm$ 0.28 and 5.91 $\pm$ 0.2, respectively, indicating good conditions of using baking soda in urban bread-producing units.

## Conclusion

This study showed that due to the use of baking soda in bread dough, a significant part of produced breads did not have suitable conditions for consumption; while, salt quantity was to some extent acceptable for the consumers. It seems necessary to increase our knowledge of bakery units about contraindication of using baking soda in bread dough. In addition, it should be noticed that the increase of using salt in bread decreases yeast activity in bread. Considering that, the increase of salt in food enhances the risk of blood pressure. Thus, it is necessary to inform the consumers about it. It is important to enhance people

's knowledge about consuming hygienic and baking soda-free breads. Also, continuous supervision of relevant organizations over produced breads' quality is quite essential.

## Acknowledgment

Hereby, we would like to appreciate Ms. Nazari, the technician of QC lab of Para-Veterinary Department of Bu-Ali Sina university.

## References

- Arastia, Z., Hejazi, T.H. and Geilari, Z. 2014. Designing effective strategies to improve performance indicators of bread industry using system dynamics: A case study in Iran. *Journal of Industrial Engineering and Management Studies* 2: 74-94.
- Chamandoosta, S., Naderi, M., Afshar, H. and Kamali, K. 2015. Amount of baking soda and salt in bakeries of Zanjan city in 2011-2012. *Journal of Human, Environment and Health Promotion* 1: 58-64.
- Faridi, H. and Rubenthaler, G.L. 1983. Effect of soda leavening on phytic acid content and physical characteristics of middle eastern breads. *Journal of Food Science* 48: 1654-1658.
- Fox, B.A. and Cameron, A.G. 1955. *Nutrition and health*. Food Science. 6th ed. London: Arnold.
- Geissler, K. and Powers, H. 2005. *Human nutrition and dietetics*. 11th ed. USA: Churchill Livingstone.
- Ghanbari, M. and Farmani, J. 2013. Influence of hydrocolloids on dough properties and quality of barbari: an Iranian leavened flat bread. *Journal of Agricultural Science Technology* 15: 545-555.
- Institute of Standards and Industrial Research of Iran. 1999. *Traditional breads and test methods*. (Number of 2628).
- Iranshahi, M., Seyedain Ardebili, S.M. and Yasini Ardakani, S.A. 2014. Survey effect of inulin and  $\beta$ -glucan on Barbari bread staling. *International Journal of Farming and Allied Sciences* 3: 1039-1043.
- Jahed Khaniki, G.H.R., Vaezi, F. and Younesian, M. 2007. Detection of baking soda in flat bread by direct pH metery and alkanity measurement. *Journal of Applied Science* 7: 3584-3587.
- Kamani, H. and Paseban, A. 2008. Indirect consumption of Soda in bakeries of Zahedan city in 1387. *Journal*

of North Khorasan 2: 59-64.

Mahan, L.K. and Escott-Stumm, P.S. 2008. *Krauses food, nutrition and diet therapy*. 12th ed. Philadelphia: Saunders Co.

Malakootian, M. and Dowlatshahi, S. 2007. The quality of the manufactured breads in Bakeries Of Jiroft. *Journal of Toloee Behdasht* 1: 60-67.

Malakootian, M., Dowlatshahi, S. and Malakootian, M. 2005. The quality of the manufactured bread and hygienic conditions of bakeries. *Iranian Journal of Environmental Health Science and Engineering* 2: 72-78.

Mosaddegh Mehrjardi, M.H., Dehghani, A., Jahed Khaniki, G.R., Shah Hosseini, F., Hajimohammadi, B. and Nazary, N. 2014. Determination of phytic acid content in different types of bread and dough consumed in Yazd, Iran. *Journal of Food Quality and Hazards Control* 1: 29-31.

Rajabzadeh, N. 2001. *Bread technology*. 4<sup>th</sup> ed. Tehran: Tehran University.

Rostami, H. and Farajzadeh, D. 2013. Studying the environmental health status and consumption of Baking soda in military and urban Lavash bakeries of Tehran in 2012. *Iranian Journal of Health Sciences* 1: 19-24.

Sani, M. 1998. Comparison of two fermentation method on quality of Tafton and Barbari breads. *Nutritional Research Institute and Food Industries*, Tehran, Iran: Shahid Beheshti University of Medical Sciences, Msc thesis.

Yarmand, M.S. 2009. Microscopic and sensory staling evaluation of bread Iranian consumed. *Iranian Journal of Food Science and Technology* 6: 83-93.

Zabihollahi, T., Goftari, S. and Garibi, F. 2013. Investigation of the amount of sodium bicarbonate and salt in different types of bread in the bakeries of Kurdistan Province from 2008 to 2010. *Scientific Journal of Kurdistan University of Medical Sciences* 18: 39-46.

Zibaenezhad, M.J., Hooshangi, M., Abtahi, F. and Heidari, S.T. 2010. A study of Salt (sodium chloride) content in different bread consumed in Shiraz city in spring/summer 2009. *Iranian Cardiovascular Research Journal* 4: 17-21.