



## Evaluation of pH and Common Salt Content in Bread Samples Produced in Mashhad, Iran

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### Abstract

**Background:** Salt content and pH degree are the quality indicators of bread which their unauthorized levels may have harmful effects on body health. Accordingly, this survey was carried out to evaluate pH and salt contents in bread samples produced in Mashhad, Iran.

**Methods:** Totally 708 bread samples (340 loaves of Lavash, 183 loaves of Taftun, 139 loaves of Barbari and 46 loaves of Sangak bread samples) were provided randomly from different bakeries of Mashhad, Iran during 2015. Levels of pH and salt in baked bread were determined according to Iranian national standards. Data were analyzed using SPSS, Inc., Chicago, USA version 16.0.

**Results:** Among 708 samples, mean salt level in different bread samples was  $1.22 \pm 0.09\%$  which 0.1% samples contained higher salt content than acceptable limit of  $\leq 1.8\%$ . There were no significant differences between content of salt as well as pH among various types of bread ( $p > 0.05$ ). The lowest and highest salt concentration were found in Taftun ( $1.21 \pm 0.08\%$ ) and Sangak ( $1.25 \pm 0.2\%$ ), respectively. Out of the total samples, 10.6% of them had  $\text{pH} \geq 6$  which were higher than the standard limit. The mean level of pH in total samples was  $5.51 \pm 0.45$ . Lavash ( $5.49 \pm 0.46$ ) and Sangak ( $5.61 \pm 0.51$ ) bread had the lowest and highest pH degree, respectively with no significant difference ( $p > 0.05$ ).

**Conclusion:** This survey revealed that there were yet some local bakeries in Iran that produced different kinds of bread with unacceptable levels of salt and baking soda. So, it seems crucial for continual supervision and monitoring in the bakeries of this area as well as training bakers not to use unacceptable additives.

### Introduction

The average consumption of bread, as a staple food in Iranian diet, has been calculated about 300 g per day. According to Iranian national standard, traditional breads are kinds of the bread made from leavening (fermented)

dough using its original ingredients such as flour, water, salt, and leavener. Sangak, Barbari, Taftun, and Lavash are the main kinds of traditional bread produced in this country (ISIRI, 2014).

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According to national standards, pH and salt content are of quality indicators of bread which their acceptable levels are  $\leq 6$  and  $\leq 1.8\%$ , respectively (ISIRI, 2014). Determination of pH is carried out as an indicator if usage of baking soda (bicarbonate sodium) in the bread formulation. Fraudulent addition of this compound in bread is done in order to leaven the bread (Hassanzadeh et al., 2002). Besides industrial hazards of using baking soda, numerous health complications have been reported including, gastroenteritis (Robertson et al., 2007), hypochloremic alkalosis (Chamandoost et al., 2015), high blood pressure, as well as anemia (Forsslund et al., 2008). Despite the strict prohibition of using baking soda in the traditional bread in Iran, its usage has been previously reported in some bread-bakeries, particularly Barbari and Lavash bakeries (Rezaei-Mofrad et al., 2011; Zabihollahi et al., 2012). Due to the increasing number of deaths from cardiovascular disease as well as hypertension, the seriousness of the consumed amount of salt is too highlighted (Strazzullo et al., 2009). In normal condition, salt is provided by daily diet. So, adding excess salt to bread and other food products is not acceptable. However, during baking bread, salt is added to dough in order to decrease its loosing and increase its elasticity to inhibit lowering the quality of bread (Malakootian et al., 2005). This survey was carried out to evaluate levels of pH and salt in bread samples produced in Mashhad, Iran during 2015.

### Materials and methods

In this cross sectional study, 708 bread samples were obtained randomly in Mashhad, Khorasan Razavi province, Iran during 2015. Sample size was determined based on the usage frequency of each type of bread in Mashhad city. In this regard, different bread samples including, Lavash ( $n=345$ ), Taftun ( $n=178$ ), Barbari ( $n=139$ ), and Sangak ( $n=46$ ) were gathered from different bakeries. In order to evaluate pH and salt content in baked bread, two loaves of bread samples were chosen from each bread bakery and put into a sack and then sent to the laboratory.

Determination of NaCl was carried out according to Iranian national standard (ISIRI, 2014). All chemicals were obtained from Merck Company, Germany. One g of each dried and milled sample was weighed and placed in a flask. Then, 10 ml of silver nitrate (0.1 N) and 10 ml nitric acid were added to the flask and the mixture was heated to boiling point. While boiling, saturated permanganate (5 ml) was added to the mixture at discoloration time. Then, the solution cooled down and 100 ml water and 5 drops of ferric sulfate indicator were added and the final solution titrated with thiocyanate 0.1 N until a red-

brown color was achieved. Finally, the amount of salt was calculated by the following formula:

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

For evaluation of pH, at first, the bread samples were dried out in lab and were ground to powder. An amount of 10 g of dried samples were weighed exactly in a flask and 90 ml neutralized distilled water was added and shaken vigorously before determination of final pH of each sample based on the method described by ISIRI (2014).

All procedures were performed in triplicate and data expressed as mean  $\pm$  standard deviation. The results were analyzed using SPSS, Inc., Chicago, USA v. 16.0.

### Results and discussion

Among 708 samples, mean salt level in different bread samples was  $1.22 \pm 0.09\%$  which 0.1% of samples contained higher salt content than the acceptable limit of  $\leq 1.8\%$ . There was not any significant difference ( $p > 0.05$ ) between content of salt among various types of bread. The lowest and highest salt concentration were found in Taftun ( $1.21 \pm 0.08\%$ ) and Sangak ( $1.25 \pm 0.2\%$ ), respectively. Mean pH level in total samples was  $5.51 \pm 0.45$  and 10.6% of them had  $\text{pH} \geq 6$  which were higher than the standard limit. Lavash ( $5.49 \pm 0.46$ ) as well as Sangak ( $5.61 \pm 0.51$ ) had the lowest and highest pH degree, respectively with no significant difference ( $p > 0.05$ ).

High pH values of the samples indicated the existence of baking soda in bread with a considerable variation in amount. In a former study by Zabihollahi et al. (2012), the total average of pH in bakeries of Kurdistan province was below the maximum acceptable level, but the total average of salt level was more than standard limit with the average of  $2.19 \pm 0.78\%$ . In the current study, both pH and salt content were in standard limit in most of the samples. The highest pH degree was in Sangak bread and the lowest was in Lavash bread. These results were in contrast with the results of the study which reported that the most frequent soda consumption were in Lavash and also Barbari, respectively (Rezaei-Mofrad et al., 2011). Zabihollahi et al. (2012) reported that the highest use of salt was observed in Lavash and the lowest in Sangak. Rezaei-Mofrad et al. (2011) measured pH and salt value of 400 bread samples of Mehrdasht, Najafabad region of Iran and found that in 91.5% samples, pH was less than 6.2 and most unacceptable samples were Lavash. Alami et al. (2014) reported that the mean pH degree and salt level in traditional bread samples in Gonabad, Iran was  $5.92 \pm 0.214$  as well as  $1.30 \pm 0.547$ , respectively. They also indicated that pH as well as salt levels were below the standard interval limits in about 30% and

7% of the bread samples, respectively. Based on a similar work in another country, it has been reported that mean salt content of Turkish bread samples was  $1.82 \pm 0.41$  (Akpolat et al., 2009), being somewhat similar to our finding. Considering the recent studies reported in about five years ago, it is obvious that the rate of unacceptable bread samples of Iran has remarkably been decreased comparing to the earlier survey published in 1995 which showed about 85% of the bread samples of Isfahan, Iran had unauthorized salt level (Bashtam and Sarafzadeh, 1995). This finding may be resulted from implementation of national plan of supervision in the bakeries carried out by the Iranian food and drug organization in the last years.

### Conclusion

This survey showed that there were yet some local bakeries in Iran that produced different kinds of bread with unacceptable levels of salt and baking soda. So, it seems crucial for continual supervision and monitoring the bakeries of this area as well as training the bakers not to use unacceptable levels of additives endangering public health.

### Conflicts of interest

The authors declare that there is not any conflict of interest.

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