


Investigating the consumption of baking soda and salinity levels in bakeries in the city of Ilam in the years (2021-2023)

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Article Info	ABSTRACT
<p>Article type: Original article</p> <p>Article History: Received: Sep. 01, 2024 Revised: Oct. 30, 2024 Accepted: Nov. 16, 2024 Published Online: Dec. 27, 2024</p> <p> Correspondence to: Moayed Adiban Department of Environmental Health Engineering, School of Health, Ilam University of Medical Sciences, Ilam, Iran</p> <p>Email: Adiban-m@medilam.ac.ir</p>	<p>Introduction: Bread provides a significant portion of the daily energy, minerals, and vitamins needed by the body. In recent years, the use of baking soda and extra salt in our country has become common to quickly leaven bread dough and compensate for the dough's deficiencies. Baking soda in bread prevents the absorption of calcium and iron, causes digestive disorders, and salt also endangers the health of individuals, especially those with kidney disease and high blood pressure. Therefore, the aim of this study is Investigating the use of baking soda and salt in bakeries in the city of Ilam from 2021 to 2023.</p> <p>Materials & Methods: This study was conducted using a descriptive analytical and cross-sectional method in the city of Ilam. In this study, all the bakeries in the city of Ilam, which numbered 222, were considered as the statistical population. The pH and salt percentage of the sampled breads were measured according to the standard method and industrial research of Iran, number 2628, by the Food Control Laboratory of the Food and Drug Administration. The permissible pH level for Sangak bread is between 4.6 and 5.6, and for other breads, it is between 5 and 6. Values higher than these indicate the use of baking soda. Also, salt content above 1 percent indicates excessive use of salt.</p> <p>Results: From the year 2021 to 2023, 1732 loaves of bread were sampled and sent to the Ilam Food Control Laboratory. The frequency percentage of salt content in all the collected samples is equal to 0.28. And the pH frequency percentage obtained from all the breads in the collected samples was 7.9. This statistic indicates that the preventive measures in the field of environmental health have yielded positive results in recent years.</p> <p>Conclusion: The average salt percentage in the studied bakeries was within the standard limit; however, the average pH percentage was slightly above the standard limit, which can be attributed to the quality of the flour. Despite the ban on the use of baking soda in bread production by the Ministry of Health, this substance continues to be used in the mentioned process.</p> <p>Keywords: Baking soda, Salt, Bread, Bakery</p>

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Introduction

In today's world, the issue of nutrition and its relationship with health and hygiene is of great importance. Nutrition that is based on scientific principles and takes into account all the needs of our body ensures human health (1). Bread is the most important staple in the diet of many Iranians and people around the world, especially low-income and large families. Despite major changes and the variety of foods, bread remains the first choice in the meals of Iranian families, especially at breakfast (2). Consuming 300 grams of healthy bread daily can meet about half of the important nutritional needs, including protein, calories, minerals, calcium, iron, and various B vitamins, required by an adult (3). Bread holds great importance in our country, such that approximately 46.2% of the total daily energy consumption of an urban individual and about 59.3% of the total daily energy consumption of a rural individual is provided by bread (4). The four main ingredients for making bread include wheat flour, water, salt, and yeast (or leaven), and the bread made from them must have characteristics according to the Iranian national standard (5). A healthy bread has an appealing appearance, appropriate volume, and high digestibility. To prepare healthy bread dough, a sufficient amount of yeast must be used, and it should be allowed to ferment and rise for the necessary duration under favorable conditions, which is the most critical part of the hygienic bread production process (5,6). Most of the nutrients present in the natural composition of wheat and flour can enter the metabolic cycle and be digested and absorbed only when fermentation occurs completely (7). Unfortunately, many bakeries, for various reasons including the quick preparation of dough, covering up the poor quality of flour and the visual defects of the bread, as well as the impatience and lack of skill of the workers employed in the bakeries and their ignorance of additives and harmful chemicals such as baking soda and extra table salt, use these substances and artificially leaven the bread. This practice causes chronic and severe health problems and disorders

such as indigestion, gastrointestinal system disturbances, malnutrition, allergies, and similar issues. The use of baking soda, which is the most commonly used unauthorized chemical for artificial fermentation of bread, increases the absorption of heavy metals such as lead, cadmium, and mercury, and disrupts the absorption of iron, zinc, and calcium, leading to serious long-term health issues (8,9). Using baking soda darkens and dulls the appearance of the bread and gives it an undesirable alkaline taste and flavor (11). Since bread is widely consumed in our society, the presence of large and uncontrolled amounts of salt, which is the main dietary source of sodium, may lead to the development of cardiovascular diseases such as hypertension, where sodium ions play a significant role in causing this disease (7). Fortunately, in recent years, significant measures have been taken regarding the optimization and enrichment of flour and the improvement of the quality of bread produced in the country by various scientific and executive bodies. One notable example is the program to eliminate baking soda from the bread-making process in the country since 2001 (10). But in some bakeries, due to the ease of use and lack of awareness about the harmful effects and health impacts of baking soda and extra salt, they still continue to use them (11). According to the studies conducted by the Institute of Health Research, Nutrition, and Food Industries of the country, the per capita consumption of bread in Ilam province is higher than in other provinces of the country, and the importance of examining the appearance and chemical quality of bread in this province is very high (12). This study was conducted to continue the trend of improving bread quality in bakeries and to examine the status of baking soda consumption and salinity levels in the bakeries of Ilam city from 2021 to 2023, with its findings and recommendations potentially contributing to the improvement of bread production conditions.

Materials and methods

In the present cross-sectional (descriptive-analytical) study, 222 bakeries located in Ilam County were

examined from the years 2021 to 2023. To determine the performance of bakeries regarding the use of baking soda and salt, two loaves of bread were selected and placed in a plastic bag along with sample specifications (including location and date of sampling) and sent to the Food Control Laboratory of the Food and Drug Administration of Ilam University of Medical Sciences. In the laboratory, the samples have been tested for the presence of baking soda and salt percentage according to the method of the Iranian National Standards and Industrial Research Institute, number 2628 (4). To determine the pH, the bread sample was first dried in the laboratory air and completely powdered. Then, 10 grams of the dried sample were accurately weighed in a 250 cc beaker, and 90 cc of neutral distilled water were added, and the lid was closed. The beaker was shaken intermittently for 10 to 15 minutes, and then the pH of the sample was measured with a calibrated pH meter. The experiments were conducted using the Metrom model 827 standard pH meter and the Sartorius scale with an accuracy of 0.001. To measure the salt, 1 gram of the dried and ground bread sample was accurately weighed in a 250 cc beaker, and then 10 cc of 0.1 normal silver nitrate solution and 3 milliliters of concentrated nitric acid were added, and

the solution was then boiled. During boiling, 5 cc of saturated permanganate was added to make the solution colorless. After cooling, 100 cc of distilled water and 5 drops of ferric ammonium sulfate reagent were added, and titrated with 0.1 normal potassium thiocyanate solution until a reddish-brown color appeared, ensuring the color remained stable for 15 seconds (4). After conducting the experiments, the collected data were analyzed using Exel software.

Findings and Discussion

In this study, data obtained from 222 bakeries located in Ilam County (including 1732 bread samples) from the years 2021 to 2023 were analyzed. In Table 1, the number of breads sent to the laboratory is shown by type of bread and by year. As shown in the table, the total number of sampled breads in 1400 was 454 breads (Sangak bread, Lavash bread, Taftoon bread, sonnati bread, Samoon bread, Saji bread, and Barbari bread), in 1401 it was 644 breads (Sangak bread, Lavash bread, Taftoon bread, Traditional bread, Samoon bread, Saji bread, and Barbari bread), and in 1402 it was 634 breads (Sangak bread, Lavash bread, Taftoon bread, sonnati bread, Samoon bread, Saji bread, and Barbari bread).

Table 1. Number of breads sent to the food control laboratory by type of bread

Type of bread Year	Sangak	Lavash	Taftoon	Rizeshi	samoon	saji	barbari	total
2021	78	65	45	80	59	32	95	454
2022	123	83	52	103	70	65	137	644
2023	125	102	64	110	51	42	140	634

The number of compliance and non-compliance cases of the pH of bread from bakeries in Ilam County with the standard level, categorized by year and season from 2021 to 2023, is shown in Tables 2 to 4, respectively. The criterion for the presence of baking soda in bread is based on pH measurement, which according to the Iranian National Standard Table, the

permissible pH level for Sangak bread is between 4.6 to 5.6, and for other types of bread, it is between 5 to 6. Values higher than these indicate the use of baking soda.

The results of Table 2 show that out of a total of 454 sampled breads, 39 breads were found to have a pH level higher than the standard limit and were

identified as containing baking soda. Among these, the highest number of non-compliance cases (28 cases) were related to Sangak bread. It is worth mentioning that after Sangak bread, the highest pH non-compliance is related to Saji bread, and overall, the lowest pH and baking soda non-compliance is related to Taftoon bread. In a study conducted by Abdi and colleagues in 2015 on the breads of the city of Nurabad Lorestan, Sangak bread had the highest

percentage of non-compliance with the standard pH limit at 23.67%, which is consistent with the results obtained in 2021 (10). However, in a study conducted by Zabihollahi and his colleagues from 2008 to 2010 on the breads of Kurdistan province, Sangak bread had the lowest amount of baking soda consumption among the various types of bread baked in this province, with a non-compliance rate of 1.8% with the standard pH limit (3).

Table 2. The number of compliance and non-compliance cases of pH with the standard level in the year 2021, categorized by season.

season Type of bread	Spring		Summer		Autumn		Winter	
	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity
Sangak	25	5	12	3	7	3	5	18
Lavash	20	0	17	1	12	0	14	1
Taftoon	12	0	15	0	10	0	8	0
Rizeshi	23	0	19	0	12	1	25	0
samoon	11	2	15	0	17	0	14	0
saji	9	0	7	0	6	0	7	3
barbari	22	0	35	0	18	2	16	2
total	122	7	120	4	82	6	89	24

The results of Table 3 show that out of a total of 644 sampled breads, 62 breads were found to have a pH level higher than the standard limit and were identified as containing baking soda. Among these, the highest number of non-compliance cases (51 cases) were related to Sangak bread. And after that, the highest number of non-compliance (10 cases) with the pH standard limit is related to Barbari bread.

The study conducted by Kamarehie and his colleagues in 2010 to examine the amount of baking soda in various types of bread baked in Khorramabad found that Barbari bread had a high non-compliance rate of 47.6%. However, Sangak bread had the lowest percentage of deviation from the standard pH limit, which is consistent with this study for Barbari bread but inconsistent for Sangak bread (11).

Table 3. The number of compliance and non-compliance cases of pH with the standard level in the year 2022, categorized by season.

season Type of bread	Spring		Summer		Autumn		Winter	
	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity
Sangak	17	19	19	5	25	12	11	15

Lavash	28	0	19	0	19	0	16	1
Taftoon	13	0	19	0	11	0	9	0
Rizeshi	22	0	20	0	36	0	25	0
samoon	23	0	17	0	17	0	13	0
saji	9	0	46	0	4	0	6	0
barbari	26	4	40	2	43	1	28	3
total	238	23	180	7	155	13	108	19

The results of Table 4 show that out of a total of 634 sampled breads, 34 breads were found to have a pH level higher than the standard and were identified as containing baking soda. Among these, the highest number of non-compliance cases (27 cases) were related to Sangak bread. It is worth noting that Taftoon and Rish-Rishi breads, followed by Lavash, Saji, and Barbari breads, have the lowest pH non-compliance levels. This is while in a study conducted by Goodarzi and colleagues on the bread consumed

in the city of Bandar Abbas in 2014, the highest non-compliance with the standard pH limit was related to Lavash and Taftoon breads, with 21% and 16% respectively, which does not align with the present study on the bread samples of 2023 (6). However, in the study conducted by Zarei and colleagues in Isfahan from 2002 to 2005, Lavash bread had a pH non-compliance rate of 0.94% and Taftoon bread had a rate of 2.55%, which is consistent with this study (16).

Table 4. The number of compliance and non-compliance cases of pH with the standard level in the year 2022, categorized by season.

season Type of bread	Spring		Summer		Autumn		Winter	
	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity	Conformity	Non-conformity
Sangak	17	7	25	4	31	12	5	4
Lavash	27	0	31	0	19	0	24	1
Taftoon	15	0	21	0	12	0	16	0
Rizeshi	27	0	16	0	35	0	32	0
samoon	13	2	7	0	10	0	17	2
saji	12	0	12	1	8	0	9	0
barbari	39	0	25	0	31	0	44	1
total	150	9	137	5	146	12	167	8

Based on the information obtained from all samples, the frequency percentage of pH obtained from all breads is 7.9. Among these, Sangak bread, with a frequency percentage of 32.82, has the highest amount of baking soda consumption. And for Taftoon bread, no case has been observed where baking soda has been used. By examining the

consumption of baking soda in different seasons over three consecutive years, no significant relationship was observed, as in 2021 the highest consumption of baking soda was in winter, in 2022 in spring, and in 2023 in autumn. The likelihood of increased use of baking soda in Sangak bread could be due to the low quality of the flour used or to give the bread an

appropriate appearance. It could also be due to the acceleration of the bread baking process, which is why some bakery operators resort to using baking soda. In the study by Parizad and colleagues in urban bakeries of Ilam province in the years 2003 and 2004, the amount of baking soda consumption was estimated to be 27 percent. Comparing this with the present study shows that the amount of baking soda consumption in the city of Ilam has significantly decreased compared to before. This difference could be due to the increased skills of bakers, heightened awareness of the dangers of baking soda among individuals, and changes in the mechanisms of regulatory and environmental health agencies in the area.

The results of the study on the salt content in various types of bread in the city of Ilam, shown in Table 5,

indicate that the average total salt consumption is 0.28 percent, which is within the standard limit. The highest instances were related to Barbari and Samoon breads, with two cases of non-compliance with the standard salt consumption level. In a study conducted by Kamarei and his colleagues in 2010 to examine the salt content in various types of bread baked in Khorramabad, the salt consumption was within the standard range and is consistent with the present study (11). However, in a study conducted by Zabihollahi and his colleagues from 2008 to 2010 on the breads of Kurdistan province, the average total salt percentage was 2.19%, which is slightly above the standard limit and does not align with the present study (3). The use of table salt is primarily to reduce fluidity and increase dough resistance to prevent the dough from sticking to the oven walls.

Figure 5. Number of compliance and non-compliance cases of salt with the standard level by year.

Year Type Of Bread	2021		2022		2023	
	compliance	Non-compliance	compliance	Non-compliance	compliance	Non-compliance
Sangak	78	0	123	0	105	0
Lavash	65	0	83	0	102	1
Taftoon	45	0	52	0	64	0
Rizeshi	80	0	103	0	110	0
samoon	57	2	70	0	51	0
saji	32	0	65	0	42	0
barbari	95	0	136	1	140	1
Total	452	2	643	1	632	2

Conclusion

The adherence to the standard for salt usage in the studied community is high, and the consumption of baking soda in bread preparation has also decreased compared to the past decade. However, the results of this study and other studies indicate that the unauthorized use of baking soda in the preparation of bread, especially Sangak and Barbari, in Ilam province still continues. Despite the harmful effects of using baking soda and the prohibition of its use in

bread preparation by the Ministry of Health, health officials and other relevant organizations must make a concerted effort to ensure its complete removal. Due to the irreparable damage caused by salt to the body, especially in patients with kidney issues and high blood pressure, there is a need for training, issuing monitoring identification with the presence of a technical supervisor, continuous monitoring and control of bakeries, conducting ongoing applied research to improve the quality of bread, and

intensifying the enforcement of legal regulations. This is necessary to ensure the production of high-quality bread and the complete elimination of baking soda and other unauthorized additives from bread production. Additionally, training for bakers is provided through relevant agencies such as the Ministry of Commerce, Medical Education, and the Ministry of Health and Treatment, as well as the media. Furthermore, the aforementioned training is recommended to the public through newspapers and other means.

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Ethics approval

Ethics approval Ethical approval for this study was obtained from Deputy of Public Health for Ilam University of Medical Sciences.

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Conflict of interest

The authors declare no conflict of interest.

Authors' contributions

Designing the study and data gathering were done by AA and ZG. Analyses and interpretation were done by MA. FN prepared the draft of the paper. All authors read, revised, and approved the final manuscript.

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