

Study of Sodium bicarbonate and Sodium chloride in Bakeries of Isfahan-Iran

Zoher Azarbad, Hamed Haddad Kashani

Anatomical Sciences Research Center, Kashan University of Medical Sciences, Kashan, Iran
Email: Hamedir2010@gamil.com, Tel: 0098-9137430153

Abstract: Background: Bread is a valuable source of proteins, minerals and calories. Baking soda (Sodium bicarbonate) prevents the absorption and digestion of bread and more salt (Sodium chloride) used in production of bread also causes different diseases. Considering the scarcity of studies done on small towns and rural areas, this study was conducted to determine the amount of soda and salt in bakeries of Isfahan-Iran. **Materials and Methods:** This cross-sectional descriptive study was carried out on 50 bakeries of Isfahan district during 2009-10. A total number of 400 samples were randomly collected from all bakeries in four steps (two loaves from first batch) which then sent to the laboratory. None of the bakers had knowledge of the research intention during sampling and samples were taken in random days. The measurement of pH and salt was done in accordance with the standard method of Institute of Standard and Industrial Research of Iran (ISIRI, 1999). The standard pH <6.2 indicative of no consumption of baking soda in bread and salt less than 2 g / 100 g was considered as the reference. Data were analyzed using Chi-square. **Results:** The pH less than 6.2 was seen in 91.5% of samples. Most pH above 6.2 was in Lavash bread (12.5%). In 64.5% of samples, the amount of salt was more than the standard. Yeast was used in 80% of bakeries. Also the least amount of yeast was used in dried bread (66.7%). Moreover, the results indicated that there is a significant difference between the amount of baking soda consumption and the season and between the type of bread and the salt consumption ($P < 0.002$). **Conclusion:** It could be concluded that the amount of baking soda used in the bakeries of this study was not high; bakers either had no enough knowledge about the amount of salt used for production of bread or had more other reasons to use salt more or less than the standard. Therefore, drastic measures to control the amounts of baking soda and salt in bakeries are recommended.

[Zoher Azarbad, Hamed Haddad Kashani. **Study of Sodium bicarbonate and Sodium chloride in Bakeries of Isfahan-Iran.** *Academ Arena* 2018;10(9):80-84]. ISSN 1553-992X (print); ISSN 2158-771X (online). <http://www.sciencepub.net/academia>. 9. doi:[10.7537/marsaaj100918.09](https://doi.org/10.7537/marsaaj100918.09).

Keywords: Baking soda (Sodium bicarbonate), Salt (Sodium chloride), Bread, Bakeries

Introduction

Bread as a valuable and inexpensive food that playing an important role in the primary energy needs of Iranian families (1, 2), is considered as the most important source of energy, protein, minerals and vitamins (3-5). Almost 60-65% of the protein and calories and near 2.3 g of minerals come from bread (6), which is in the case of its complete fermentation, most nutrients of natural wheat and flour can be metabolized, digested and quickly absorbed by the body because of phytic acid that combines with minerals such as iron and calcium and making them insoluble in water and thus preventing the absorption of wheat minerals.

Phytic acid can be inactivated during baking process. For this, enzymes, called phytases, inactivate during fermentation, thus enhance the nutrient absorption (7). Phytase can be effective only when it is used with yeast or sourdough and let it be left for an appropriate length of time (8, 9) and in breads made with the aid of baking soda because of the absence of phytase enzyme, the minerals of bread cannot be digested and absorbed.

Yeast is a living and single-celled organism that converts starch and sugar into alcohol and carbon

dioxide during a complex process and makes the digestion easy for the human digestive system through breaking down the long chains of starch (10). Carbon dioxide and alcohol produced by yeast form bubbles that make the dough rise, and give bread its spongy texture. Moreover, the alcohol and acid produced during fermentation process remove the pathogenic microorganisms from bread and enhance its hygienic production. Having low pH level due to producing acid and colloidal state of gluten can make the durability of bread longer.

The yeast containing a lot of proteins, minerals and vitamins is routinely added to bread for its better processing. The most distinguishing advantage of yeast for consumers is adding a pleasant taste and aroma to bread which is due to creation of aromatic acids produced by yeast. (7).

Another commercial alternative for processing food is adding baking soda to dough which due to its lack of fermentation causes some disorders in digestion and absorption of effective minerals and bivalent, thus leading to gastroenteritis (12). Using baking soda in bread increases the absorption of heavy metals (e.g. lead and mercury) which in long-term can make severe disorders (13). Despite the numerous

advantages of yeast, studies have shown that only 45-55 percent of the bakeries in Iran actually use industrial yeast or leaven and the amount of baking soda in bread varies from 2-47%.

Considering the importance of properties and advantages of using the yeast and disadvantages of using baking soda in bread processing, the strict supervision on eliminating the soda in bread production is considered an important priority in health center policies. Since bread is a highly consumed food in our community, the existence of large and uncontrolled amount of salt in bread may also lead to cardiovascular diseases, hypertension (23). Moreover, other diseases (e.g. gastric cancer, osteoporosis, and bronchial hyperactivity) are also caused by increased salt intake (24). Nowadays, most bakers (40%) have no information on the amount of salt added to a known amount of flour (16, 17, 20); few of them (26.5%) in cases use salt less than any other cases more than the standard limit (20). The average salt used in Mashhad-Iran bakeries was 1.95g in 100 g (15) and in Isfahan-Iran 2.66 g per 100 g which are more than the standard limit (25). Therefore, regarding the high average consumption of bread among low-income, traditional and rural families and the notion that the magnitude of some problems related to malnutrition (e.g. iron deficiency) can be decreased by improving the quality of flour and bread and also the scarcity of such studies in small towns and rural areas, the aim of the present study was to determine the amount of baking soda and salt used in bread bakeries of Isfahan-Iran.

Materials and Methods:

This cross-sectional descriptive study was conducted in all bakeries of Isfahan district, during 2009-10 From a total number of fifty bakery units taken part in the study and officially active in Isfahan, the detailed numbers of different bakeries were as follows: (Taftoon: 23), (machine-made bread:10), (Sangak: 2), (Barbari: 1), (Lavash:4), (dried: 3) and (home-made: 7).

Samples were randomly collected from all bakeries in four steps (2 loaves from first batch) and sent to the laboratory to determine the values of the variables. Sampling was done in random days with no bakers' knowledge of the research intention. The measurement of pH was done in accordance with the standard of Iranian Institute for Standard and Industrial Research (ISIR, 1999 issue No.2628) and using an electrical pH meter (26). Samples with normal pH ($pH < 6.2$) were considered as having no baking soda and above the limit containing baking soda. The amount of the salt in samples was determined according to the standard of (ISIRI issue No.2628), Standard No.2628. The amount of salt $< 2 \text{ g} / 100 \text{ g}$ was considered as standard level and more than that as the nonstandard. Presence or absence of yeast (leaven or sourdough) in the bakeries was determined in accordance with the recommendations of Environmental Health Guidelines. The obtained data were analyzed using chi-square test and descriptive statistics.

Results:

The pH for 91.5% of the samples was less than 6.2. In general, the pH of most samples taken from Lavash bread was above 6.2. This study showed no significant difference between the pH of samples and the type of bread (95% level of confidence). The amounts of salt in 142 cases of all samples (35.5%) were standard. The highest amount of salt in bread production was in Taftoon in 74 cases (40.2 %) and Lavash (18.75%) (7) that the Chi-square test detected significant difference (in level of 95%) between the type of bread and salt use ($P < 0.027$).

Yeast was used in 80% of the bakeries and the lowest level of yeast was seen in dried bakeries (66.7%) Table (1). Regarding the frequency distribution of baking soda in different seasons of the year, summer season in 24 cases (70.59%) had the highest frequency for baking soda use with a $p > 6.2$ in bread samples ($P < 0.001$).

Table.1. Frequency distribution of the amount of pH and salt used in bakeries

Type of bread	Number of samples (N)	Salt < 2% in bread samples		Ph < 6.2 in bread samples	
		Percent	Number	Percent	Number
Taftoon	184 80 16 8 32 56 24 400	40.2	74	93.4	172
Machine-made		37.5	30	90	72
Sangak		25	4	100	16
Barbari		25	2	100	8
Lavash		18.75	6	87.5	28
Home-made		32.2	18	96.5	48
Dried		33.4	8	91.7	22
Total		35.5	142	91.5	366

Table.2. Frequency distribution of the availability of yeast and the numbers of bakeries

Type of bread	Number of bakeries (N)	The amount of yeast used in bakeries	
		Percent	Number
Taftoon	23	86.9	20
Machine-made	10	80	8
Sangak	2	100	2
Barbari	1	100	1
Lavash	4	75	3
Home-made	7	100	7
Dried	3	66.7	2
Total	50	80	43

Discussion

The results of this study indicated that the pH in 8.5% of the bread samples taken from the bakeries was greater than 6.2. The pH level of bread in Isfahan, Yazd, Chaharmahal & Bakhtiary, Savad kooch, Kashan, Shahroud, and the total mean in the country were 8%(16), 12%(17), 5%(15), 11.8%(14), 9.8%(28), 2%(18) and 9.1%(19), respectively were in accordance with the results of this study.

The level of baking soda used in bakeries in Ilam, Tehran, Rafsanjan, Kerman have been reported 27% (20), 17 % (29), 22% (21) and 47.7(22), respectively. In addition, it has been reported that 25% of Tehran bakeries apparently used baking soda in producing bread and only 45-55% of bakeries used industrial yeast which weren't in accordance with the results of the present study. According to the results of the present study, it seems that the small towns and rural areas, like big cities, have made progress in reducing baking soda in the bread; the results taken are contrary to other studies. The reason for this discrepancy may be that the bakers in Ilam, Tehran and Rafsanjan have inadequate knowledge about the disadvantages of soda or in general about the principles of the production of the most common types of bread baked in each region. In general, today 42% of the bread produced in our country is Lavash (7) and the highest amount of baking soda was used in Lavash, followed by Barbari. Moreover, the results of other studies showed that the amount of baking soda in Lavash bread were in Zahedan 60% (31), Gorgan 88.9 % (32), Islam-shahr 60% (33). The amount of baking soda used for producing Barbari bread in Kashan was 39.1% (28).

Reportedly throughout our country, the barbari bread with 21.2% had the highest and Taftoon the lowest amount of baking soda (19). Besides, as Taftoon bakeries were more than the Lavash bakeries in our study; therefore, the reason for the lower amount of baking soda in these bakeries may be attributed to the low number of Lavash bakeries. Only 10% of the bakeries in this study were Lavash (8%)

and Barbari (2%) and then the remaining (46%) were Taftoon bakeries. And the apparent fact is that despite the lower numbers of Lavash and Barbari bakeries, those types of bread even contained more baking soda. Hence, considering the disadvantages of using baking soda instead of yeast (e.g. digestive disorders, disorder in calcium, phosphorous, and iron absorption) (7) and the level of knowledge of bakers regarding the disadvantages of soda, enough knowledge only in 28%; moderate to weak in 27% (32), the suggestion on providing trainings the appropriate use of baking soda in bread should be considered, especially for Lavash bakeries and in other stages through the acquired trainings, the knowledge of the bakers about the disadvantages of baking soda can be evaluated by repeated visits and supervision under legal considerations. The results of this study indicated the amount of salt used in 64.5% of samples exceeded the standard level.

In similar studies have been conducted in Mashhad, the average salt use (1.95g /100 g) reportedly exceeded the standard level (34). In similar studies more than 85% of samples taken from Isfahan had salt more than standard and only 15% less than standard (25). In addition, the amount of salt used in Sabzevar bakeries was 25 ± 2.07 g/100 g and researchers claimed that the number of samples with the salt level above the standard were relatively high (35).

The amount of salt in bakeries of Sistan and Baloochestan increased from 2.1 to 3.4 g/100 g during 2004-7 that was not only exceeded the standard but also had an increasing trend.

In researches done in Yazd and Rafsanjan, the level of salt (1.3g /100g) (21) was similar to the results of the studies done in Tehran and Yazd (17, 37). The average amount of salt in Ilam was 1.34g /100g and 14% of bakeries used salt more than standard and also the required amounts of salt in 33.4% and 10.4% of the bakeries were less than and more than standard, respectively. To sum up, 43.8% of the bakers didn't

have enough knowledge and skill for determining the standard level of salt for producing bread.

Conclusion:

It seems that most bakers either do not have enough knowledge about the standard level of salt used for the production of bread or have some other reasons for using salt more or less than the standard (e.g. type of flour) or some other factors which need to be investigated in another series of studies. To sum up, bakeries require strict supervision on using baking soda and especially salt for the production of bread. Hence, drastic control measures are recommended to control the amount of baking soda in bakeries by relevant agencies, such as the Iranian Ministry of Health and Medical Education.

Corresponding Author:

Hamed Haddad Kashani

Anatomical Sciences Research Center, Kashan University of Medical Sciences, Kashan, Iran

Email: Hamedir2010@gamil.com,

Tel: 0098-9137430153

References:

1. Mojarad M H. Survey on Causes of Bread Wastages in Country and Methods of Prevention. *Congress of Bread*, 1998, Tehran, Iran. [In Persian].
2. Gharooni J. L. Technology of flat breads, translated by Mohammad Hojati and Hossein Azizi, Tehran: Andishmand publications; 2005. [In Persian].
3. Gafarpour M., Contribution of Secure Society Nutritional Needs. Bread: Nutritional Technical Problems, healthy, Economical and Social, *Congress of Bread*, 1998, Tehran, Iran. [In Persian].
4. Aminpour A. Bread Nutrition Value and the Best Approach for Secure The People Needs. *Congress of Bread*, 1998, Tehran, Iran. [In Persian].
5. Amirahmadi B. Determination of Bread Consume in Urban and Rural of Country and Bread Contribution in Families Vital Energies and Expense. *Congress of Bread*, 1998, Tehran, Iran. [In Persian].
6. Rajabzadeh N, Bread Technology, Tehran: Tehran University Press, 1986. [In Persian].
7. Sugar cane development & by-products commercial Co, available at: <http://www.iran-suger.com/fa/home.asp?pn=kmintr> accessed on 2011.11.10.
8. Brune M, rossander L, Hulten L, Hallberg L, Gleepar A, Sandberg AS. Iron absorption from bread in humans: Inhibiting effects of cereal fiber, phytate & Inositol phosphates with different number of phosphate groups. *Journal of Nutrition* 1992, 122:442-449.
9. Larsson M, Sandberg A S. phytate reducing in bread containing oat flour, oat bran or rye bran. *Journal of cereal Science* 1991, 14: 141-149.
10. Katina, K. 2005. Sourdough: a tool for the improved flavor, texture and shelf-life of wheat bread. VTT Biotechnology. VTT Technical Research Centre of Finland, VTT 569: 13-41, 53-75.
11. Nayini N R, Mar kakis p. effect of fermentation time on the inositol phosphates of bread. *Journal of food Science*, 1983: 48.
12. Pomeranz Y. wheat: Chemistry & technology. American Association of cereal Chemists, vol.2, St-Paul: Minnesota, U.S.A, 1988.
13. Mohammadi M. Approach to Wheat, Flour and Bread, Bread and Cereal institution Press: 2004. [In Persian].
14. Zezoli M, Mahmoodi K, Hazrati M. Determination of Soda in Savadkoh Bakeries in 2004-2005. *8th National Congress of Environmental Health*, 2005 Nov 8-10. Tehran. Iran. [In Persian].
15. Moshtagi Mogadam M, Amini F, Mardani J. Research of the Quality of Bread and Removing of Bicarbonate of Soda and Reduction of Wastage of Bread in Charmahal & Ba Khtiari 2003-2004. *7th National Congress of Environmental Health, 2004. Shahre Kord, Iran*. [In Persian].
16. The Medical education, treatment and hygiene Ministry. The amount of the Consumption of baking Soda in the bakeries, the report of the General office of the Nourishment, 2005. [In Persian].
17. Kargar M.H, Mozafari H. An investigation on bread in Yazd city. *Journal of Yazd Shahid Sadougi University of Medical Sciences*, 2001; 5 (2):16-23 [In Persian].
18. Sharifi Arab G, Arab Ameri M, Rodbari M, Abbasi M, Nazarian A. Survey on Bread Qualification and health in Shahrod Bakeries-2009. *12th National Congress of Environmental Health*, 2010 Nov 8-10. Tehran. Iran. [In Persian].
19. Beigi A, Gafari M, Gholami R, Karbord A, Jogataei F, Sori L, etal,. Survey on Reduce Use of Soda in Process of Traditional Bread in Country. *12th National Congress of Environmental Health*, 2010 Nov 8-10. Tehran. Iran. [In Persian].
20. Gholami parizad E, Amarloei A, Jalali A, Naseri R. Bread and its Health Problems in Ilam Urban

- Bakeries (2003-4). *Scientific Jour of Ilam Med University* 2005;13 (1):44-49. [In Persian].
21. Malakoutian M, Loei M,. The Quality and Hygienic condition of bread in Rafsanjans Bakeries. *Journal of Rafsanjan University of Medical Sciences and Health Services* 2003; 2(3,4):180-186. [In Persian].
 22. Malakoutian M, Dolatshahi Sh, Garib,. The Quality and Hygienic Condition of Bakeries in Kerman. *8th National Congress of Environmental Health*, 2005 Nov 8-10. Tehran. Iran. [In Persian].
 23. Wilson J. D., Braunwald E., Isselbacher, K., Harrison, Principles of Internal Medicine vol.1, 12th ed., Mc Grow-Hill, Inc., New York. 1991.
 24. Kaplan N.m., Neww evidence on the roll of sodium in hypertension, *Am.J. Hypertens*, 1990,3(2), pp.168-9.
 25. Bashtam M, Sarafzadeh N, Dokhani. Determination of Sodium Chloride In any Type of Bread Consuming by Esfahan City Population By Chemistry analyses. *Teb & Tazkieh* 1995; 13:23-25. [In Persian].
 26. The Standard institution and N.2628, Bread yeast. Attributes and the ways of the test, 2003. [In Persian].
 27. The Standard institution and N. 2577, Nacl. Attributes and the ways of the test, 2003. [In Persian].
 28. Asemi Z, Dlati M, Ziae kashani Sh, Agili Mohtaseb T. Survey on Kashans Bread in regarding to Soda in 2004-5 2005, National Congress of Health and Food Safety 2004. *Tolo e Behdasht*: 3(3);3. [In Persian].
 29. Mirfakhraii F. Considering the amount and reasons of Bread Wastages in the families and bakeries of Tehran city. *4th National Congress on Food Technology*, 2001, Tehran, Iran [In Persian].
 30. Omidvar N, Aminpour A, Ghavamsadri M, Kavian F, Rokni SH, Knowledge, Attitude, and Practice of Bakers Regarding Different Aspects of Bread Production in the City of Tehran. *Iranian Journal of Nutrition Sciences & Food Technology*, 2007; 2 (2):27-36. [In Persian].
 31. Kamani H, Bazrafshan E, Kord Mostafa Pour F, Rakhsh e Khorshid A. Ansari H, Khomri A. Survey on Consideration of avoid to use of Soda in Bakeries Low 2007, *11th National Congress of Environmental Health*, 2008, Zahedan. Iran. [In Persian].
 32. Rahimzadeh H, Kargar M, Dadban Y, Sadeghi M, Beirami S,. Gkorgkan Bakerie, s Knowledge, Attitude and Practice regarding to Use of Soda in Bread in 2006. *11th National Congress of Environmental Health* 2008, Zahedan, Iran. [In Persian].
 33. Jahed Khaniki Gh, Younesian M, Paseban Gh, Survey on rate of Elimination of Soda in Flat Bread in Slamshahr Bakeries 2005, *Tollo e Behdasht* 2006:5(17):21-31. [In Persian].
 34. Hasanzade M.K., Khashayarmannesh Z, Shahbazi H, Shafai A, Evaluation of Sodium Ion and Sodium Chloride in Various Kinds of Bread in City of Mashhad. *Teb va tazkieh* 2002;4:48-54. [In Persian].
 35. Khamirchi R, Tavana E. rate of Nacl and Soda in Bread in Sabzevar Bakeries, *11th National Congress of Environmental Health* 2008, Zahedan, Iran. [In Persian].
 36. Hoseini A, Firozkohi M, Zoragi A, Hagani far H, Bazrafshan E, Elimination of Soda in Systan va Balochestan Provence from 2004-2007, *11th National Congress of Environmental Health* 2008, Zahedan, Iran. [In Persian].
 37. Kadivar M, Shahedi M. The bread technology and considering its production quality, distribution and the ways of its improvement in future. *The Standard Magazine*, 2002; (115). [In Persian].
 38. Gholami parizad E, Khosravi A, Purabass A, Mehdizadeh MA. A Study on the Effective Factors of Bread Wastes. In Ilam Urban Bakeries (2006-7). *Scientific Jour of Ilam Med University* 2008;16(4:8)8-17. [In Persian].