



Incidence of Potassium Sorbate in Doogh (Iranian Yoghurt Drink) Produced in West Azerbaijan Province of Iran

Amir Rahimirad*

Food & Hygiene Control Laboratory, Deputy for Food & Drug, Urmia University of Medical Sciences, Drinks Safety Research Center. Urmia, Iran

Abstract

Doogh is a traditional Iranian drink prepared by fragmentation and dilution of yogurt, with addition of salt and flavouring. Dairy products are favorable environment for microbial growth due to high nutrient and relative humidity. One of the most important parameters in the food industry production and consumption is enhancing the shelf life of the product. Therefore, food additives such as potassium sorbate are used in this regard. While application of potassium sorbate as a preservative with excellent antibacterial and antifungal properties in various foods is common, but its addition into Doogh is forbidden according to national standards of Iran. The objective of this study was to determine the prevalence of preservatives in Doogh in West Azerbaijan province, Iran, from 2011 to 2014. 172 samples of various commercial Doogh were tested for determination of potassium sorbate. The results showed that 14.6% of samples were contaminated with preservatives and the highest and average concentration of this preservative in analyzed samples was 722.4 and 27.136 mg/kg respectively during the past 3 years.

Key Words: Doogh, Post marketing, West azarbaijan province, Potassium sorbate

Introduction

Doogh is an Iranian type of traditional fermented dairy based drink which is usually manufactured by mixing water, salt, set or stirred yoghurt, as well as some aqueous extracts of local herbs (Azarikia, 2010; Abbasi, 2010). Consumption of this drink is very common in Asia and there are clear differences between Doogh (yoghurt based beverage) and similar products which are nowadays consumed in Europe due to the presence of added edible salt as well as viscosity (Nilsson et al, 2006). The traditional Iranian yoghurt drink, Doogh, is a nutritious and refreshing drink. It is traditionally produced via adding water to full fat yoghurt and then churning it up in a special leather bag called “Mashk” followed by removing of fat along with the addition of salt and sweet-smelling herbs (Shirkhani et al, 2013). Today, various dairy products not only are important in terms of scientific research but also have thrived in international trade marketing. The most important factors that influence the acceptance of these products are health effects, desirable nutritional characteristics, unique sensory characteristics and increased shelf-life (Azarikia et al, 2010; Abbasi et al, 2010). Lactic beverages are productions that producing process of them including milk fermented by lactic acid bacteria and then diluted with water to obtain curd, or exudates whey or

permeate (Veiga et al, 2000). However, nowadays, due to increasing public awareness about the harmful consumption of carbonated beverages, tend to use the natural drinks such as dough is rising, but some manufacturers use preservatives such as potassium sorbate and Natamycin to increase product shelf life. Sorbic acid and its salts such as sodium, calcium and potassium are used in many foods such as cheese, flour products, soft drinks and fruit juices and vegetables. Their antimicrobial effects further than on molds and yeasts and less than on bacteria. The optimum activity of this acid is in pH 6.5 and at a concentration it is used, has little effect on the taste of food (Taheri et al, 2009). Sorbic acid activity increases in low pH like other weak acids that prevent the growth of microbes. This indicates that this acid has antimicrobial effect on not ionized format. Because these acids are able to pass through the cell wall and appears its destructive effects on the cells. Sorbic acid metabolism in humans is as well as other acids and generally shows less toxic effect than benzoic acid. Sorbate as a preservative in food has several advantages:

- Anti fungal and anti bacterial effect
- On effective concentration does not affect on flavorful taste and smell of food
- It is more effective compared with propionate and benzoate in acidic pH (pH <6)
- With toxicology tests, sorbat is known as a safety material in GRAS list (Generally Recognized As Safe) (Azarikia et al, 2009). Sorbate metabolism in the body through beta oxidation, cause to CO₂ and water formation. ADI (Average daily intake) and LD₅₀ of sorbat are announced 25 milligrams and 10 grams per kilogram of body weight respectively (Abbasi et al, 2009). Amount of sorbate during storage due to microbial growth, oxidation or reaction with food components is reduced. Sorbate stability depends on to food type (pH), compounds (organic acids and other additives), Aw (water activity), the number of microbes, preservative agents, moisture, storage temperature and packaging (Kooshki, 2007; Fallah et al, 2011). Food additives, conditions of storage and processing all affect on the activity of sorbate. The importance of raw milk and dairy products as a vehicle for the transmission of various diseases especially in countries where hygienic standards are not strictly enforced has been well documented (Rahimi et al, 2010). Milk and dairy products are two specific food categories with respect to the risk assessment for health. The importance of raw milk and dairy products as a vehicle for the transmission of various diseases especially in countries where hygienic standards are not strictly enforced has been well documented (Rahimi et al, 2010). Milk and dairy products are two specific food categories with respect to the risk assessment for health. Finally although potassium sorbate as a preservative with antibacterial and antifungal effects is used in various foods but adding that, is as opposed to national standards of Iran (ISIRI, 2453). Therefore, with regard to the increasing public awareness of the harmful consumption of carbonated beverages, desire to natural drinks such as Doogh is increased so to determine the percentage of samples conforming or non-conforming to the national standards, survey the produced Doogh in West Azerbaijan factories in Urmia Food and Hygiene control laboratory.

Materials and method

Samples

172 Doogh samples available in West Azerbaijan province of Iran market during 2011 to 2014 were collected randomly by inspectors of Food Control Laboratories of Urmia University of Medical Sciences. The sampling was performed according to the standard and national procedures (ISIRI, 2836). All samples were stored below 4°C before analysis.

The method of potassium sorbate determination in Doogh with spectrophotometer

Preparation of standard solutions and Calibration curves

1.340 g of potassium sorbate (equivalent to 1 g sorbic Acid), was weight in a 1-liter flask and dilute to volume with distilled water. With bobble pipet values of zero, 10, 20, 30 and 40 ml of standard solution prepared separately transferred to a 100ml flask and dilute to volume with distilled water. 2 ml of the

above solution was transferred into a 200 ml flask with Auto sampler. 0.5 ml Hcl 0.1N was added to each other and dilute to volume with distilled water. The absorption of prepared Solutions was read by spectrophotometer at a wavelength of 260 nm and finally Standard curves were plotted. A calibration curve was prepared by using the potassium sorbate working solutions with various concentrations at range of 1.34–5.36 mg/L. The curve (Figure 1) was constructed before the analysis to check the pilot for linearity ($r^2 = 0.9999$) and was used for quantification of potassium sorbate. If the content of preservative in the sample was outside the calibration range, a more appropriate calibration curve was prepared, or the injection solution for spectrophotometer analysis was diluted to a potassium sorbate concentration appropriate for the established calibration curve.

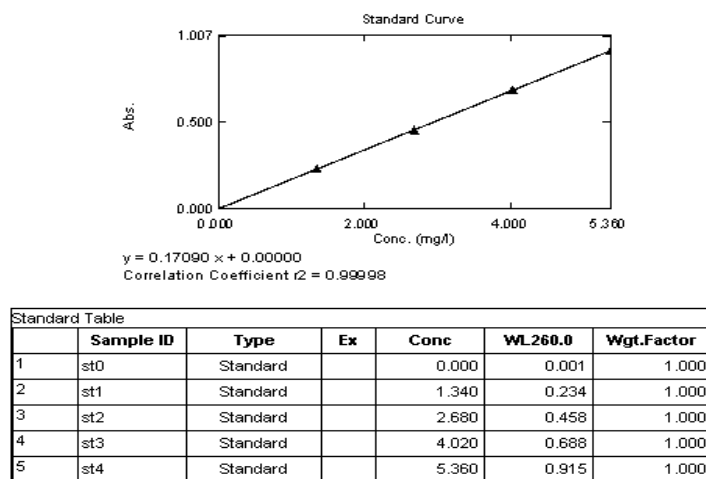


Figure 1. Standard curve of potassium sorbate

Sample Preparation

2 ml of sample was distilled and the solution was collected in 200 ml flask. 0.5 ml Hcl 0.1N was added to flask and dilute to volume with distilled water. All steps were performed to the control sample without adding samples. Spectrophotometer absorption was zero by the control sample and sample absorbance was read at 260 nm wavelength and then concentration was determined (AOAC, 2000).

Quality assurance

For evaluation of the reliability of results, in addition to using validated methods, internal quality control experiments were performed. For this purpose, recoveries of potassium sorbate were recorded by analyzing a Doogh sample spiked at 2 mg/L of potassium sorbate. Fig.2 demonstrates the chromatogram for Doogh spiked with 2 mg/L potassium sorbate, as well as, that for a naturally contaminated Doogh sample. According to the recovery values, potassium sorbate levels were corrected for recoveries. The recovery of potassium sorbate obtained by spiking the Doogh with 2 mg/L was 90.4%.

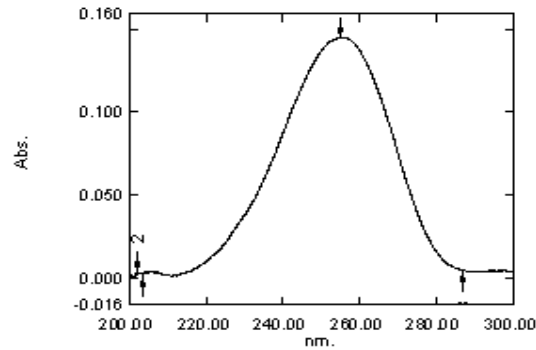


Figure 2. Chromatogram for a contaminated Doogh.

Results

Doogh is a traditional Iranian fermented product prepared from yoghurt by adding potable water, starter culture and sodium chloride. Iranian Doogh is exported and consumed in Afghanistan, Azerbaijan, Armenia, Turkey, and Balkans and to a lesser extent in other parts of Middle East and central Asia (Codex Alimentarius Commission, 2009). In the present study, a total of 172 samples of various commercial Doogh were tested for determination of potassium sorbate. The results showed that 14.6% of samples were contaminated with preservatives and the highest and average concentration of this preservative in analyzed samples was 722.4 and 27.136 mg/kg respectively during the past 3 years (Figures 3 and 4). The obtained results are comparable to the results of previous studies performed in Iran by Gholipour, Farhadieh and Salehi et al alls in 2009. Gholipour and others (2009) reported that 25.8% of analyzed Doogh samples were contaminated with potassium sorbate. Another study was done by Farhadieh (2009) in Isfahan indicated that potassium sorbate and sodium benzoate was detected in solely 25.3% of Doogh samples. The other more comprehensive survey on 45 Doogh analyzed in Hamedan for potassium sorbate and sodium benzoate in 2009 demonstrated no contamination of all samples with preservatives (Salehi et al, 2009).

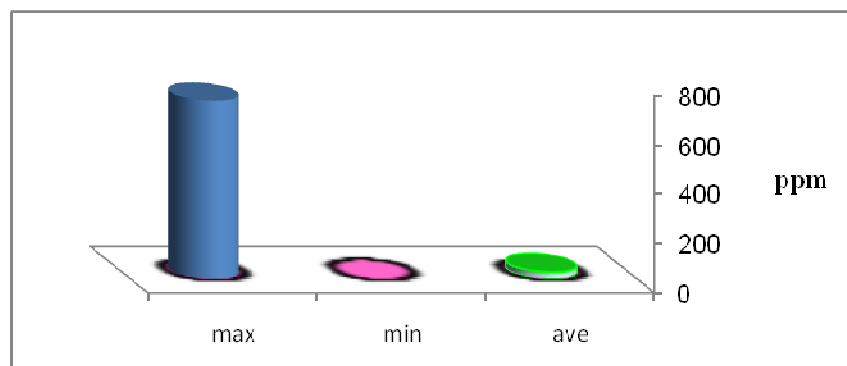


Figure 3. Maximum, minimum and average of potassium sorbate content in Doogh samples.

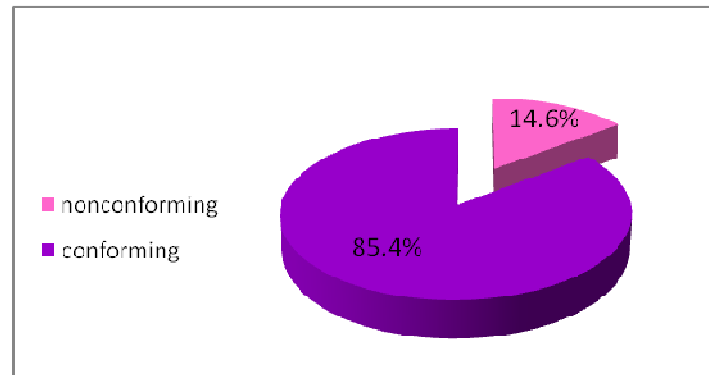


Figure 4. Percentage of conforming and nonconforming Doogh samples.

Discussion

Among dairy products, Doogh, a traditional fermented acidified drink, has special status in Iran due to its health properties. One of the main problems in milk and dairy products is mold and yeast contamination. This contamination leads to economic losses, reduced shelf life and difficulties in sensory characteristics of the final product. Furthermore, dairy products contaminants mold with ability to produce mycotoxins, are serious potential risks to consumers health. The results of this study show that producers of dairy products such as Doogh with average health status have used potassium sorbate to control mold and yeast in Doogh. This matter was done to overcome the problem of product swell. Considering that the potassium sorbate adding to Doogh is not allowed and 14.6% of samples were contaminated with potassium sorbate therefore, comprehensive supervision of the dairy industry seems necessary. Because uncontrolled use of this preservatives in food, especially dairy products and risks of this substance for human health the necessity to control and limit the use of preservatives is obvious and managers should to limit the use of these materials in their agenda. In addition to the mandatory implementation of Hazard Analysis and Critical Control Point (HACCP) programmers developed in European countries to manage the risks associated with toxicogenic fungi contamination in food manufacture companies could be a big step towards improving the quality of management and the protection of consumers' perceptions. In addition to expanding the HACCP system in our country the ability to compete in the global market in terms of exports and international trade, including WTO accession comes into existence.

Acknowledgment

The authors are thankful to the Urmia University of Medical Sciences, Urmia, Iran for their financial supports.

References

- Abbasi, A., Shirazi, N., Farshadfar, Sh. (2009). Effects of guar gum and volatile oils added to Iranian Doogh tissues. *Journal of Food Science and Technology*. First year, No.3.
- AOAC International, 2000. AOAC Official Method 28.2.02 Sorbic Acid in Wines.
- Azarikia, F., Abbasi, S., Azizi, M. (2009). Efficacy and Mechanism of combinations of hydrocolloids in preventing Doogh phase separation. *Iran Food Technology and Nutrition Science Journal*. No.1. 11-22.
- Azarikia, F., Abbasi, S. (2010). On the stabilization mechanism of Doogh (Iranian yoghurt drink) by gum tragacanth. *Food Hydrocolloids*, 24: 358–363.

- Codex Alimentarius Commission. (2009). Joint FAO/WHO food standard programme, project document for a regional standard for Doogh. Tunisia, 26-29 January 2009.
- Fallah, A. Rahnama. M, Jafari, T, S. and Saei-Dehkordi, S. (2011). Seasonal variation of aflatoxin M₁ contamination in industrial and traditional Iranian dairy products. *Food Control*, 22: 1653-1656.
- Farhadieh, F., Feizi, M., Jahanmard, E., Motamedi, A. (2009). Survey of sodium benzoate and potassium sorbate in milk products samples sent to Isfahan food and hygiene control laboratory in 2009. National Conference on Food and Beverage Safety, Oct 20-21.
- Gholipour, M., Salehifar, E., Javadian, B. (2009). Evaluation of the sorbate in Doogh manufacturing in Mazandaran province in 2009. National Conference on Food and Beverage Safety, Oct 20-21.
- ISIRI, Iranian National Standard 2453, in: Doogh - Specifications and test methods, Karaj, Iran, 2008.
- ISIRI, Iranian National Standard 2836, in: Methods of sampling for packaged agricultural products used as food, Karaj, Iran, 1974. 2nd Edition.
- Kooshki, M. (2007). Optimization of traditional Doogh production with industrial method by using maximum whey. *Journal of Food Science and Technology*. First year, No.2. Vol. 4.
- Nilsson, L. E., Lyckand, S., & Tamime, A. Y. (2006). Production of drinking products. In A. Y. Tamime (Ed.), *Fermented milks*. UK: Blackwell Science Ltd.
- Rahimi, E., Ameri, M. Momtaz, H. (2010). Prevalence and antimicrobial resistance of *Listeria* species isolated from milk and dairy products in Iran. *Food Control*, 21: 1448–1452.
- Salehi, S., Farhadian, M.H, Khodadadi, I., Yaghoubi, A., Mosavi, L., Solgi, R., Heshmati, A., Salehi, I., Vahidnia, A.A., Mashhouri, M., Kalami, Z., Karambeigi, M. (2009). Evaluation of the preservatives in dairy products manufacturing in Hamedan province. National Conference on Food and Beverage Safety, Oct 20-21.
- Shirkhani, M., Khosrowshahi Asl, A., Madadlou, A. (2013). Influence of enzymatic treatment on stabilization of traditional Iranian yoghurt drink, Doogh. 1st International e-Conference on novel Food Processing, Feb 26-27.
- Taheri, P., Ehsani, M., Khosrawidarani, K. (2009). Effect of *Lactobacillus acidophilus* La-5 on microbiological characteristics, sensory properties and textural stability of probiotic yoghurt during refrigerated storage. *Iran Food Technology and Nutrition Science Journal*, No.3. 15-24.
- Veiga.alexandrda,Modeira.lopes.A. (2000). effects of weak acid preservatives on the growth and thermal death of the yeast *pichia membranifaciens* in a commercial apple juice, *International journal of food microbiology*,56:145-151.