

Evaluation of nitrite in meat products (sausages and salami) are distributed in Birjand in 2012

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ABSTRACT

Food store for long periods by the additives such as nitrites without will change color, taste, smell and nutritional value. Carcinogenic risk is one of the most important issues of nitrite that its reason is reaction of Nitric Acid with second amines that causes to nitrosamine. The consumption of meat products is increasing day by day and the studies have been limited to a few cities. So, this research is necessary on this subject to the people's desire for using meat products. To check the amount of nitrite in meat products is distributed in stores in Birjand, 240 samples were analyzed from both sausage and salami products (1, 7 and 14 days after reaching to consumers). 923 Standard was used for measuring nitrite and to compare the results from 2303 Institute of Standards and Industrial Research of Iran. The collected data were entered in SPSS-16 software and inter-group in $\alpha = 0.05$ were analyzed by ANOVA statistical tests and descriptive statistics. ANOVA results showed that residual nitrite concentrations in sausage, salami samples at 3 time (1, 7, 14 days) after consumption was statistically significant ($P < 0.001$). Residual nitrite concentrations was order to $38.40 \pm 23.24, 35.40 \pm 16.5, 3.55 \pm 22.8$ on 1, 7 and 14 days after reaching consumers in 120 sausages types and $25.25 \pm 18.38, 27.28 \pm 13.2, 18.01 \pm 9.01$ in 120 salami types (sodium nitrite mg/kg). Residual nitrite was higher than Permissible range in %10 sausage samples and % 1.66 salami samples. The results of this study and previous studies indicate that there is residual nitrite higher than Permissible range in meat products, so, the population of our country increase and many food factories establish especially meat products, all health aspects and additives standards must be observed.

Key word: Meat Products, Nitrite, Birjand

INTRODUCTION

Meat products are considered a valuable protein source in human nutrition and protein materials that have been essential and need amino acids to provide for consumers with different tastes. So, the role of the meat industries is more to its consumption day by day. Therefore, it is necessary to provide the health, quality and quantity of products, quality control of industrial products should be done more serious and with the Widespread domain (1) Meat and its products are the main source of nitrite. Therefore, the chemical additives in foods, either naturally or artificially is very important, because overload can be dangerous and harmful (2-3) Nitrite and nitrate are used to stabilize the color of the tissue of lean meat, Features made in meat flavor, Prevent to the growth of spoilable

microorganisms (spores of *Clostridium botulinum*) , To avoid food poisoning and delay strong flavor resulting from the oxidation of fats (4-7) In foods, protein known as key of life and recommended values is 70 .8 grams per kilogram of body weight in normal people and is 10% of total calories for nitrogen balance. In humans, approximately %90-95 of edible nitrate is absorbed from the gastrointestinal tract and after 10 minutes, the average is 25 times in plasma (9-8) the amount of nitrites used in processed meat, approximately one in five is less than two decades ago (10). A study was done about the affect of additives and pasteurization on nitrosamine levels in the standard range Showed that Sodium ascorbate and sodium chloride were reduction factor of the volatile nitrosamine and pasteurization increases the rate of decomposition of nitrosamine. This study also showed that adding NaCl decrease short-chain nitrosamine such as DMNA, DENA . During curing meat with nitrite, nitrosamine levels increases in comparison with raw meat without adding additives. Nitrosamine levels are reduced by adding sodium ascorbate in meat. But freezing has little effect on the production of nitrosamine. (11) The inhibitory effect on nutrient absorption in the gut is from the adverse effects of nitrite, (12) and nitrite in the acidic conditions of the stomach cause nitrosamine which is carcinogenic compounds (13) A study showed that nitrite and nitrate use to preserve meat products, increase risk of gastric cancer (14). These compounds are formed when the temperatures reach above 130 ° C in these products. The relationship has been observed between consumption of meat products and appearing childhood leukemia and brain tumors (16-15) However, because of every citizen consumes salami and sausage about 4 kilograms in a year (8) and nitrites use in meat products, mainly as a maintainer in the widespread in the world and various studies indicate that nitrite levels (in the case of meat products) is higher than acceptable limit in those countries (2). In Iran, nitrite permissible standard is 120ppm in sausage, salami, (17) On the other hand, population and many food factories especially meat products are increasing, all health aspects and additives standards should be observed in these places especially additives that it is not harmless to humans (2). The aim of this study is to investigate nitrite levels in meat products (sausages and Salami) in Birjand In 2012, in comparison with standard and its changes over time in them.

MATERIALS AND METHODS

In this type of cross-sectional analysis to determine the amount of nitrite in meat products distributed, Birjand, Iran, first the stores Marked in this city, and Then 40 Samples were taken (4 strong consumer brands, each brand is 10 samples). From both sausage and salami products distributed in this city on three dates (1, 7 and 14 days after reaching to the consumers) total, 240 samples. Thus, 200 grams of sample were sampled in according to 690 national standard of Iran (18). The sample was mixed uniformly. 10 g was weighed with almost a thousandth of a gram. AOAC method was used for measuring nitrite on photometry method (diazotization method) with 538 nm wavelength. First, the sample transferred to a Mayer flask 300 ml for the deposition of proteins and then were added 5 ml of saturated borax solution and 100 ml of water with the lower temperature of 70 ° C. After cooling, 2 ml of potassium cyanide reagent and 2 ml of zinc acetate reagent were added in it. They were thoroughly mixed after each addition. Finally the contents of the flask were reached to a volume of 200 ml in flask. After 30 minutes, Supernatant was removed by folded filter paper so that was obtained a clear solution. For the color, certain amount of filtrate (maximum 25 ml) transferred to 100 ml volumetric flask and was added 60 ml of Distilled water in it. Then 10 ml of sulfonyl amine solution and 6 ml of hydrochloric acid solution was added and were thoroughly mixed. After 5 minutes, 2 ml of Alpha - Nftyl solution were added in room temperature in the dark and after 3-10 min, it's volume brought to 100 cc in the dark. Light absorption was calculated in a centimeter special Cell with PG Instrument spectrophotometer, model T80 * at a wavelength of 538nm. The absorbance was read and nitrite level was calculated in each sample by using the calibration curve. From 2303 standard of Standard Institute and Industrial Research of Iran was used to compare the results (18). The collected data were entered in SPSS-16 software and inter-group in $\alpha = 0.05$ were analyzed by ANOVA statistical tests and presented by descriptive statistics.

RESULTS AND DISCUSSION

Concentration of residual nitrite has been 38.40 ± 23.24 , 16.5 ± 35.40 and 3.55 ± 22.28 in 120 types of sausages were studied on 1, 7 and 14 days after reaching consumers (sodium nitrite mg per kg), 12 samples (10%) had residual nitrite higher than the accepted national standard and 108 samples (90%) had residual nitrite at the standard. So, concentration of residual nitrite has been 25.25 ± 18.38 , 27.28 ± 13.2 and 18.01 ± 9.01 (mg/kg by NaNO_2) in the above days in 120 types of sausage. The two samples of sausage (%1.66) were over the standard and 118 samples (%98/33) were at the standard. Comparison between two products in the amount of residual nitrite showed that the frequency of sausage samples (2) was much lower in comparison salami samples (12). Comparing the results of

residual nitrite concentration in the salami and sausages samples and compare it with the standards in Tables 1 and 2.

Table 1: Distribution of relative frequency in sausage product on the amount of residual nitrite and compare it with the standard

the amount of residual nitrite	frequency	percentage
Permissible range	108	90
Higher than Permissible range	12	10
Total	120	100

Table 2: Distribution of relative frequency on the amount of residual nitrite in salami product and comparing it with the standard

the amount of residual nitrite	frequency	Percentage
Permissible range	118	98/333
Higher than Permissible range	2	1/666
Total	120	100

The results indicate that nitrite is more than the standard in some samples. It Conform to the results of Yaghoby Farr and Colleagues in Sabzevar. (8) In Semnan, in a study was identified that concentration was higher than the standard in some cases and lower than the standard in other cases and the amount of sodium nitrite had highly significant difference with the standard amount in sausage and salami. (17) In the study (the amount of residual nitrite in meat products) in Tehran, the amount of residual nitrite was higher than Permissible range in sausages and salami types (60ppm) in some cases. These rates had not significantly different to each other in them (11). In the other hand, The significant difference was between the residual nitrite in a Cocktail sausage, dry and liuner salami to compared with German sausage and liuner salami in a study by Luymi and Colleagues. Table 3 shows Distribution of absolute and relative frequency of meat products so the amount of residual nitrite and meat percentage in it.

Table 3: Distribution of absolute and relative frequency of meat products so the amount of residual nitrite and meat percentage in it.

the amount of residual nitrite products so meat percentage	Permissible range		Higher than Permissible range	
	frequency	Percent	frequency	Percent
%55 Sausage	59	%98.33	1	%1.66
%70 Sausage	49	%81.66	11	%18.33
%55 Salami	88	%97.77	2	%2.22
%60 Salami	30	%100	0	%0
total(240)	226	%94.44	14	%5.55

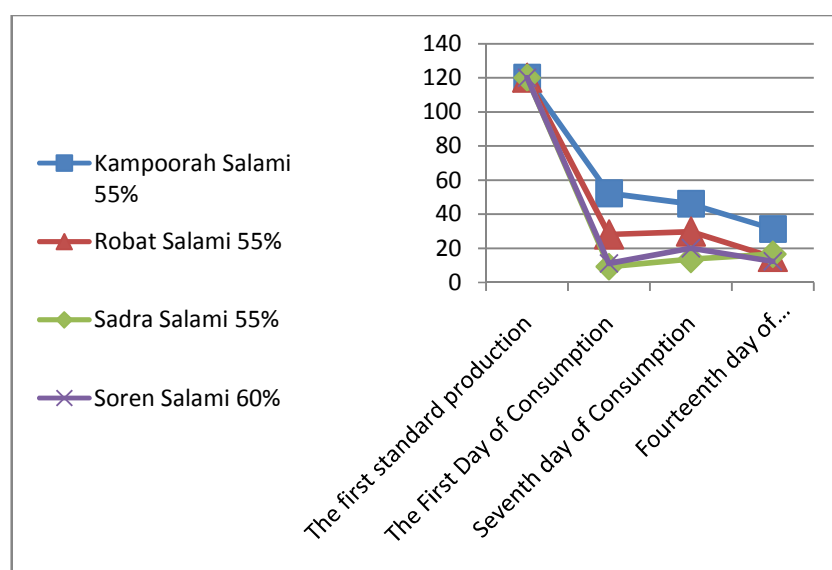


Figure 1: Comparison of nitrite concentration changes in salami in terms of reaching to the consumer by the first standard production

Results show that increasing the percentage of meat, the amount of residual nitrite is also increased higher than the permissible limit. But Kamkar and colleagues studied on meat products in Tehran in 2002 and reported the opposite of this case. (11). Perhaps, the reason of this different is for different types of products, raw materials used in the two studies.

In Figure 1, reducing the average amount of residual nitrite in the salami in terms of reaching to the consumer by the first standard production (120 ppm), this process is similar to the sausage samples.

ANOVA results showed that the average of residual nitrite concentration in sausage and salami samples at 3 time (1, 7, 14 days) after intake was statistically significant ($P < 0.001$) and residual nitrite obtained between 3.92-67.55(mg/kg NaNo₂) in salami samples and between 6.11-84.64(mg/kg NaNo₂) in sausages samples.

Table 4: Comparison of nitrite average in salami in the first, seventh and fourteenth after reaching to the consumers

Statistical View time	frequency	$\bar{x} \pm SD$	ANOVA test was repeated
the first	40	25.2 \pm 18.3	F= 13.7 p<0.001
seventh	40	27.2 \pm 13.2	
fourteenth	40	18.8 \pm 9	

According to the above table, the nitrite average in salami from one to fourteen days didn't show a significant decrease. T-Test paired test showed that the difference between the first and seventh days ($p = 0.17$) was not significant, but the first day with the fourteenth ($p = 0.003$) and the seventh with the fourteenth ($p = 0.001$) was significant. Total, nitrite concentration changes has a decreasing Process in the salami samples.

Table 5: Comparison of nitrite average in sausages between the first, seventh and fourteenth, after reaching to the consumers

Statistical View time	frequency	$\bar{x} \pm SD$	ANOVA test was repeated
the first	40	38.4 \pm 23.2	F= 16.4 p<0.001
seventh	40	35.4 \pm 16.5	
fourteenth	40	22.2 \pm 3.5	

According to the above table, the nitrite average in sausage from one to fourteen days showed a significant decrease. T-Test paired test showed that the difference between the first and seventh days ($p = 0.20$) was not significant, but the first day with the fourteenth ($p = 0.001$) and the seventh with the fourteenth ($p = 0.001$) was significant. Total, nitrite concentration changes has a decreasing Process in the sausage samples. The results of this study on nitrite concentration changes in meat products, has been a decreasing trend. . Mirzaei's study and Colleagues on nitrite concentration changes during maintenance time with different meat percentage showed that nitrite added to meat products contain different amounts of meat during maintenance time is reduced (19), that match to the results of this scheme. In a research that was also conducted by Honikel, showed cold storage for 60 days reduced to nitrite. (13) In addition a research was done by Irfan aksu and colleagues in 2004 on a kind of meat products (pastirma) showed that Increasing the maintenance time, nitrite is reduced (20). Zhukova and colleagues studied about the rate of N-nitrosamine and nitrites in 186 samples of meat and meat products on production and at 30.60 and 90 days after the date of production and storage under standard conditions Showed that the N-Nitrosodiethylamine was between 0.1-30 mg/kg and 16 samples were higher than permissible range. Proper storage conditions caused that 16 samples have been nitrite more than permissible range. On the other hand, the amount of nitrite was 0.2- 9.184 mg/kg and only 4 samples had nitrite more than permissible range. N-nitrosamine levels rise to maintenance time, 8 samples from 52 samples had N-nitrosamine more than permissible range after maintenance 60-90 day. In 2001 different samples of salami and sausage products from different manufacturers were tested for the amount of residual nitrite by Abolfazl Kamkar and colleagues in Iran. In general, the amount of residual nitrite was variable between 1 - 108 ppm in the products that were tested. In total, the amount of residual nitrite in 4.4 percent of the product was more than permissible range, 60 ppm (11).

CONCLUSION

In total, the results show that Safety products perfectly preserved from production time and sample until testing time. But the quality results of some products have a difference with standard limit. The results of this study compared with previous studies conducted in the country show that fortunately, sufficient supervision by relevant

organizations to raise the quality of meat products has been effective in reducing the amount of residual nitrite. Also to note that nitrite concentration is reduced over time, recommend that the appropriate maintenance conditions observe for these products and it is best that they are at least consumed after 7-10 days from production time. Today, nitrites use mainly as a maintainer in meat products in the widespread and the results of different studies, and this study shows that the amount of nitrite (cases in meat products) is more than permissible range in those countries and considering this fact that nitrosamine and nitrites can be effective to prevalence and incidence cancer in humans and animals. On the other hand, so population increase and many food factories establish especially meat products, all health aspects and the additives standards must be observed. In most countries, certain rules must be observed about sodium nitrite and health authorities are trying to reduce as much as possible this chemical. Ascorbic acid is a substance that plays a similar effect nitrite in meat products, pathogenic effects is not known from balanced use of its or its salts. So it is better, sodium nitrite reduce to at least and is used sodium ascorbate. Since sodium nitrite can cause a risk to human health and consumers must have enough information about the products. So recommended the amount of sodium nitrite in meat products should be carefully and continuously monitored.

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