



EVALUATION OF RESIDUAL NITRATE OF SALAMI IN KERMANSHAH PROVINCE IN WEST OF IRAN

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ABSTRACT

Meat is animal brawn that is used as food by human and animal. Meat and its products are valuable source of protein in animal and human nutrition. Nitrate compounds usually applied in meat products in order to create the desired flavor, color, and good taste, increasing storage time and preventing spore growth of bacteria especially *Clostridium botulinum*, but the complications resulting from their applications shall be followed standard rules. In this study, authors describe the levels of residual nitrate in salami in Kermanshah province. A total of 81 samples of salami collected and assessed amount of residual nitrate with spectrophotometry method. Results indicated that the amount of residual nitrate in 2.46 percent of the products was more than standard concentration, but in most of their products was lower than standard. The amount of nitrate in 4 day and in November was most. Also, this study demonstrated that the remaining nitrate in all meat products that stored at 4°C is decreased in 10 and 20 days, so reduced quality of salami over time after production.

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INTRODUCTION

Salami is a meat product consisting of air-dried and fermented meat, typically pork or beef¹. There are several varieties of salami in Europe, these salami varieties including Cacciatore, Chorizo, Fegatelli, Milano, Ciauscolo, Felino, Genovese, Finocchiona, Hard, Napoli, Winter salami, Vysočina, Spegepølse, Soppressata, German salami, Saucisson, Pepperoni, Nduja, Lardo and Kulen^{2, 3}. In Iran, all of these varieties of salami called "Salami". Salami is considered a valuable protein source in animal and human nutrition and protein materials that have been used amino acids to provide for consumers with different tastes. So, the role of the meat industries is more to its use daily. It is needed to provide the health, quantity and quality of products, quality control of industrial products should be done more solemn and with the full skirt⁴.

Nitrates as additive are used in many foods, especially cured meats such as salami, bacon, bologna, pastrami, hot dogs, corned beef, pepperoni, and other deli meats such as cured ham and turkey. In salami, nitrate is a usually used additive in processed meat products which is used for some goals such as leaving a stabilizing color, suitable taste, and increasing antioxidant and antimicrobial effects particularly, against

infectious bacteria such as clostridium⁵. But excessive use of residual nitrate is perilous. When nitrates are used, they convert to nitrites in the body, which form nitrosamines. During curing meat with nitrate, nitrosamine amounts increase in comparison with raw meat without adding additive. Nitrosamines are chemical compounds of the chemical structure R¹N-N=O. These molecules have a nitroso group bonded to an amine. In animal studies, nitrosamines have caused birth defects as well as increased pregnancy loss. Also, nitrosamine as a powerful carcinogen can cause cancers including thyroid, bladder, esophageal, stomach, colorectal, nasopharynx, kidney, prostate, central nervous system, and non-Hodgkins lymphoma cancers. Residual nitrate of salami may also double risk for lung disease such as pneumonia⁶⁻⁹. Thus, it is necessary to regulate levels of residual nitrate in salami.

Based on knowledge of authors, there is a very little data about amount of residual nitrate in salami is distributed in Kermanshah province, in west of Iran. So, the aim of the new study was assessed levels of residual nitrate in salami in comparison with standard and its changes over time in them.

MATERIALS AND METHODS

In this study, determine the amount of residual nitrate in salami distributed, Kermanshahin 2012 (November) and 2013 (January and February). First in the salami factories in this province 81 samples were taken. 200 grams of sample were sampled in according to 690 national standard of Iran. The sample was mixed uniformly. 10 g was weighed with almost a thousandth of a gram. AOAC method was used for determination residual nitrate of salami samples on photometry method with 538 nm wavelength. The sample transferred to a Mayer flask 200 ml for the deposition of proteins and then were surcharged 100 ml of distilled water and 5 ml of saturated borax solution with the lower temperature (about 70 °C). After cooling, 2 ml of zinc acetate reagent and 2 ml of potassium cyanide reagent were added in it. After mixing, the contents of the flask were reached to a volume of 200 ml in flask. After 30 minutes for obtaining a clear solution, supernatant was separated by folded filter paper. For the color, 25 ml of filtrate 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 were added and thoroughly mixed. After 5 minutes, 2 ml of Alpha - Nftyl solution were added in 25 °C temperature in the dark. After 3-10 min, its volume brought to 100 ml in the dark. Light absorption was computed with spectrophotometer (model T80) at a wavelength of 538nm. A standard curve was developed using several concentrations of nitrate¹⁰. All data are expressed as mean and standard deviation. Statistical comparison between group means were done through one-way ANOVA followed by Tukey's post-hoc test. $P \leq 0.05$ was considered as significant.

RESULTS AND DISCUSSION

Meat as a food is consist of water, protein, fat, carbohydrates and other soluble non-protein substances. Many of people use meat and meat products rich of protein every day¹¹. Meat products are products, resulting from the processing of meat or from the extra processing of such processed products¹². One of this meat products is salami. Salami now is a main part of daily diet, and also is considered as one of the alternative protein sources. In salami, nitrate stabilize the meat's color and flavor, and prevent the growth of spore-forming *Clostridium botulinum*⁵. Since the nitrate is carcinogen, so it is necessary that amount of this molecule controlled in salami⁶⁻⁹.

In this study, the amount of residual nitrate was changeable between 295 – 441 ppm in the salami that were tested. Average concentration of residual nitrate has been 401.89, 391.67 and 381.22 (November 2012), 336.78, 326.44 and 326.44 (January 2013) and 360.33, 347.44 and 347.44 ppm (February 2013) in 81 samples of salami were studied on 4, 10 and 20 days after producing, respectively. In a study showed that amount average of residual nitrate concentration is high in Iran. Also, in this study demonstrated that amount average of concentration of residual nitrate in Mazandaran (in north of Iran) is 115.1mg/kg on 4 day after producing¹³. In other study indicated that level of residual nitrate concentration in Shiraz is 124.85 ± 5.3 mg/kg on 4 day after producing (in south of Iran)¹⁴. In this experiment, 2 samples (2.46 %) had residual nitrate higher than the accepted national standard and 79 samples (97.54 %) had residual nitrate at the standard. The results of residual nitrate concentration in the salami samples are tables 1-2.

Table 1 Distribution of relative frequency in salami on the amount of residual nitrate and compare it with the standard.

The amount of residual nitrate	Frequency	Percentage
Permissible range	79	97.54
Higher than Permissible range	2	2.46
Total	81	100

Table 2 Comparison of residual nitrate concentration (ppm) average changes in salami in 4, 10 and 20 days.

Month	4 day	10 day	20 day
November	401.89	391.67	381.22
January	336.78	326.44	326.44
February	360.33	347.44	347.44

As demonstrated in above tables, residual nitrate concentration is more than the standard in some samples. Also, ANOVA results showed that the average of residual nitrate concentration in salami samples at 3 time (4, 10, 20 days) after intake was statistically significant ($P < 0/001$), so that amount of residual nitrate in 4 day is more than 10 and 20 days, and level of residual nitrate in November is more than January and February. The results of this study on nitrate concentration changes in salami, has been a decreasing after 4 day.

CONCLUSION

The results show that nitrate concentration is reduced over time, so it is best that they are at least used before 10 day from production time. Also, this study indicates that the amount of nitrate in some samples is more than permissible range in Kermanshah and considering this fact that nitrate, nitrite and nitrosamine can be efficacious to spread and occurrence several cancers in animals and humans.

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