

THE STABILITY OF THE CONTENT OF NITRATES AND NITRITES IN SEMIDURABLE MEAT PRODUCTS

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Background

In the technology of salted and brined meat products (with medium and long shelf life) nitrites (NaNO_2) and nitrates (NaNO_3), (KNO_3) are used as constituent parts of the "nitrite salt for brine". Nitrates and nitrites are added to meat to accelerate the process of brining, to preserve red color of the meat, and to prevent the activity of the anaerobe bacteria in low pH values of the brine. The nitrites stimulate the activity of the sodium chloride that prevents the activity of microorganisms and proteolytic enzymes. During the procedure of brining nitrous-myoglobin and metmyoglobin may appear as a result of chemical processes in dependence of the atmosphere of oxidation-reduction. On the other hand in the brined meat products some toxins and carcinogen nitrosamine such as DMNA (dimethyl-nitrosamine) and DENA (diethyl-nitrosamine) can also be detected.

Objectives

Nitrites are highly toxic: a deadly dosage for human beings is 2,5 to 3 grams. According to positive regulations final meat products (with medium and long shelf life), may contain up to 15mg% of nitrites, expressed as NaNO_2 , and technologically justified quantities of nitrites it is necessary to verify their content in meat products. The analysis of nitrites is usually followed by detection of nitrates as well. In this paper the authors followed the changes in concentration of NaNO_2 and NaNO_3 in final meat products, from the moment of the production to their expiration date.

Methods

- The investigation was done in five different poultry products, with medium shelf life, made from cooked meat, chicken sausages and pate, produced in the MIS KRESEVO BIH production line during the period between April and December 2001.
- The analyses of nitrates and nitrites were done according to previously formed plan and over the period from production until the expiration date of separate products.
- The extraction of nitrates and nitrites from the particularized and homogenized samples of meat products was done in warm bath ($t = 96^\circ\text{C}$) with addition of borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) over a 20 minutes period.
- Clearing of the solution was done with addition of the Carrez II solution in hot media ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$).
- The development of color was realized at an aliquot part of the solution added to the "reagent pillow" of the HACH, USA, cat number 2107-69 in cold media.
- The measurement of optical density which came out in pink coloring of the compound was done at the HACH UV VIS spectrophotometer DR/4000U, in a civet of $\varnothing=1\text{cm}$, at wavelength $\lambda=507\text{nm}$ after 20 minutes reaction time, and based on the program 2630, in the concentration area of 0-0,5 mg/l N- NO_2 .
- The measurement of the content of nitrites was done directly from the cold extraction solution with addition of urea (to mask nitrites) also at the HACH spectrophotometer in the UV area at wavelengths $\lambda_1=220\text{nm}$ and $\lambda_2=275\text{nm}$ in the quartz civet, 1cm long, according to program number 2500, in concentration area of 0-10,2 mg/l N- NO_3 .
- The analysis of the samples of meat products to the content of nitrites and nitrates was conducted in parallel with the control groups made from standard solutions of NaNO_2 and NaNO_3 .

Results and discussion

The changes of the content of nitrites and nitrates in the final meat products from poultry meat was followed up from the beginning of the production process until the moment of the products' expiration dates and it was presented in figure 1. and 2. At the beginning the concentration of nitrites varied between 2,3 and 7,2mg% NaNO_2 and between 0,018 to 0,036% NaNO_3 in various products. These concentrations were within the allowed limits according to positive regulations. According to other investigated parameters of the content such as water, ash, proteins, fats, and polyphosphates the samples satisfied the appropriate requirements for poultry meat products (we did not present these parameters in this paper). The investigated "nitrite salt" for brine added to these products contained 0,57% NaNO_2 and 1,16% NaNO_3 . The duration for different products varied between 45 and 60 days.

Conclusions

- In the final poultry meat products the concentration of nitrates and nitrites decreased over the period of time.
- The decrease of the nitrite concentration was realized much faster and in percentages was much higher than that of the nitrates.
- The changes of the concentration of NaNO_2 and NaNO_3 in the samples were conditioned by oxide-reduction in the atmosphere.
- The authors did not bring in the correlation additional concentrations of nitrites and nitrates in the meat products with additional concentration of reduction compounds such as ascorbic acid that was included in the declaration of the content.
- In their further work the authors need to determine the correlation between the changes of NaNO_2 and NaNO_3 and additional concentrations of ascorbic acid and eventually the existence of nitrous-amines in meat products.

Pertinent literature

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Figure No 1.: Concentration change of NaNO₂

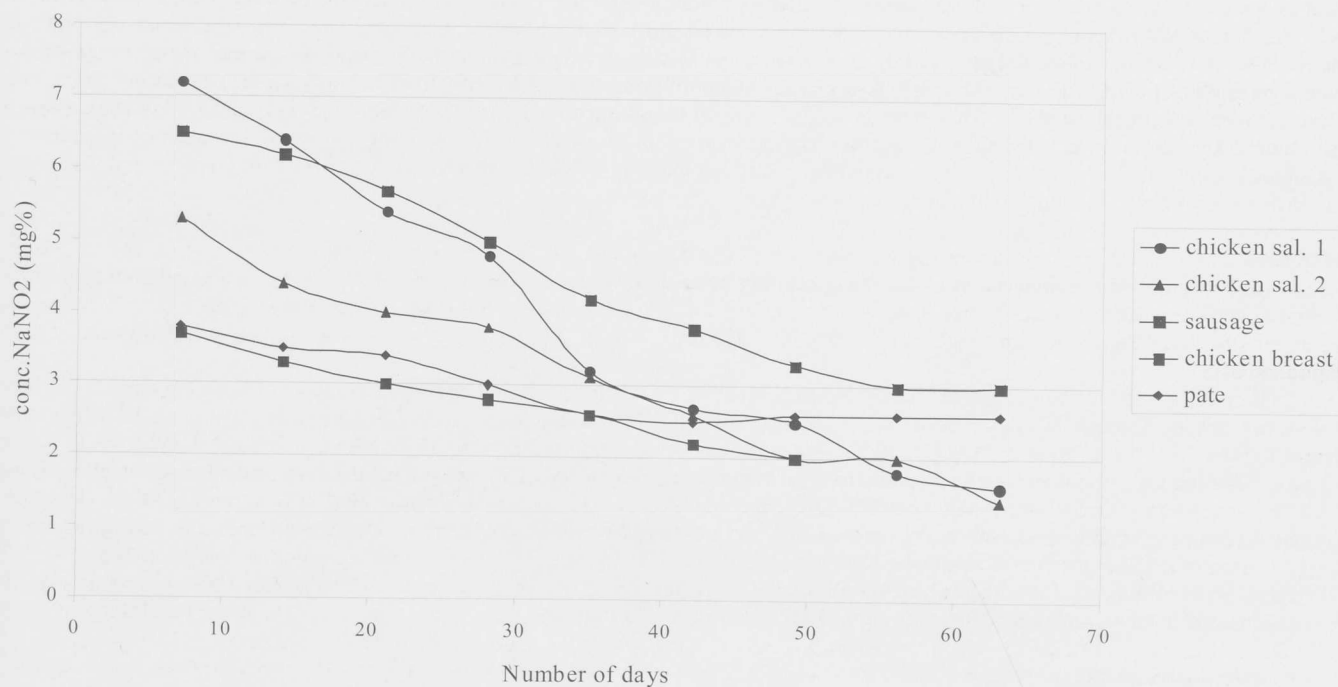


Figure No 2.: Concentration change of NaNO₃

