

THE PRESENCE OF NITRITES, NITRATES AND HEAVY METALS IN RAW-DRY MEAT PRODUCTS IN THE BRASOV AREA ROMANIA

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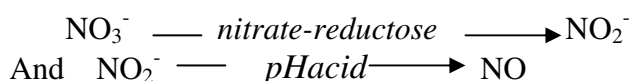
Summary: This study monitors presence of residual nitrite, nitrate and of metals such as Pb and Cd in raw-dry meat products obtained as industrial meat products at three factories in the Brasov area in Romania. The results shows that for all cases, the receipts are respected and the level of nitrites and nitrates are in the limits accepted by the law. The heavy metals plumb and cadmium are detected in very small amounts or not detected. Concerning the content in nitrites, nitrates and heavy metals, the analysed raw-dry meat products are adequate for consumption.

INTRODUCTION

Nitrites and nitrates are added to the meat products for technological and antibacterial reasons:

- maintenance of the red colour
- development of flavour
- slowing-down of fat oxidation process
- protection against the spreading of *Clostridium botulinum*.

Nitrate, weaker as nitrite, is a deposit of nitrite which, under the action microorganisms containing nitrate reductase, can change into it. The chemical reactions are as follows:



NO react with myoglobin and leads to a colourful complex – the typical red colour in meat products. NO_2^- turns into NO_3^- by means of oxidation (Getty, 1998).

Because of the presence of nitrites in meat products is related to N-nitroso compounds, which could be carcinogenic, the controlling and checking of the added dosage is compulsory. In order to secure the meat products quality

and safety for customers the addition of nitrates and especially that of nitrites is strictly monitored. The maximum admitted quantity of these additives is determined by the law.

The presence of heavy metals, such as plumb and cadmium can lead to changes in the human metabolism the consequence of which could be acute intoxication if taken in large quantities. For preventing these aspects maximum limits for the admission of these elements in meat products are imposed.

The goal of the present study is to monitorise the presence of residual nitrite, nitrate and of metals such as plumb and cadmium in raw-dry meat products obtained in some factories in the region of Brasov, Romania.

MATERIALS AND METHODS:

Six raw-dry products, sausages and salami produced by three meat factories in Brasov were analysed.

For the analysis, aqueous solutions were prepared. Proteins were eliminated from samples by heating at temperatures of 70-80°C for 30 minutes and by using the Carrez I solutions (22% zinc acetate), Carrez II (potassium ferrous cyanide 10%), considered to be the most efficient. The supernatant was afterwards filtered and used to determine the nitrate and nitrite content of samples (Zanardi et al., 2002).

Samples were weighted on an electronic balance with a precision of 10⁻⁴g. The determination of nitrites was made using the standard method (Griess) (Vlantoiu et al., 1982). The nitrates and nitrites content were analysed by using a spectrophotometer UV-VIS at 520nm in comparison with a etalon curve made for standard nitrite sodium solutions. The determination coefficient of Pb, and Cd respectively, r^2 , as well as the standardized values of these elements are presented in table 1.

Table 1. The standard values and the determination coefficient of heavy metals

Element	The determination coefficient, r^2	Standard values (Order 141/2004 A.N.S.V.), ppm (mg/kg)
Pb	0,997	0,1
Cd	1,00	0,05

In order to determine the nitrate content, that was reduced to nitrite by passing through a Cadmium column.

For the determination of Plumb and Cadmium, samples were burned to ashes and diluted. The results were measured using a spectrophotometer with atomic absorption capacity.

RESULTS AND DISCUSSIONS:

The determinations of residual nitrite content in raw-dry meat products, respectively raw-dry sausages and salami produced by three well-known factories in Brasov are presented in Table 2.

The content in residual nitrite was monitored during a period of time between 1 and 30 days (1, 3, 5, 13, 20 and 30 days).

The results show that the nitrite dosage differs with the type of product and the receipt (the factory that obtains it). The initial quantity does not exceed the limit of 7mg/100g composition. The value of the residual nitrite content drops considerably, reaching values under 1.0 mg/100g in all products until day 13. This is a consequence of the own microbiota activity or to other microorganisms added as starter cultures. At the end, a minimum level of NO_2^- under the 0.2 mg/100g limit is established in all analysed products.

The nitrate content determined in the raw-dry products is displayed in table 3. The determinations were made after the stages of fermentation and smoking of the samples.

On analysing the obtained results, it can be noticed that the limits of the nitrate in the raw-dry meat products vary from 0.57-3.52 mg/100g (on day 5), slowly rising on day 13 and 20 and, eventually, the limits fluctuates from 2.57 – 5.48 mg/100g.

For the determination of heavy metals (Plumb and Cadmium), determinations on the final product analysed as well as on raw materials used for sausages formulations were made. The results are expressed as the arithmetical media of two parallel measurements. The results are presented in Table 4 and shows that the products do not jeopardize the customers health in any way.

On analyzing the obtained values it can be stated that the products are not harmful for the consumers in terms of heavy metals (Pb is within accepted limits and Cd was not detected in any sample).

Table 2. The residual nitrite content in raw-dry products

Name of product	Abbreviation of factory	Day					
		1	3	5	13	20	30
		Limits NO ₂ ⁻ (mg/100g)					
Luca Salami*	Firm I	2.536	0.252	0.204	0.185	0.096	0.0086
Banatean Salami	Firm I	4.873	2.270	0.215	0.202	0.113	0.061
Timis Salami	Firm II	3.70	1.073	0.159	0.109	0.059	0.013
Baciu Salami	Firm II	0.923	0.280	0.246	0.127	0.108	0.016
Spicy sausages	Firm III	5.23	2.17	2.563	0.215	0.202	0.113
Chorizo sausages	Firm III	6.15	4.30	2.853	0.670	0.285	0.106

* - The fermentation process was made by means of starter cultures

Table 3. The nitrate content in raw-dry products

Name product	Abbreviation of factory	Day			
		5	13	20	30
		Limits NO ₃ ⁻ (mg/100g)			
Luca Salami	Firm I	1.04	1.58	1.79	2.70
Banatean Salami	Firm I	3.52	3.26	4.15	5.36
Timis Salami	Firm II	1.80	1.86	2.17	4.92
Baciu Salami	Firm II	0.57	1.22	1.95	2.98
Spicy Sausages	Firm III	1.38	2.10	2.77	2.57
Chorizo Sausages	Firm III	1.93	2.67	3.10	5.48

Table 4. The Pb and Cd content in raw-dry meat and sausages

Name product	Pb, ppm	Cd, ppm
Pork	0.0874	0.00
Beef	0.0702	0.00
Spicy sausages	0.0899	0.00
Chorizo sausages	0.0684	0.00
Baciu salami	0.0798	0.00
Timis salami	0.0776	0.00
Banatean salami	0.0832	0.00
Luca salami	0.7785	0.00

CONCLUSIONS

- In order to make quality products that would be safe for consumers the use a high-quality raw material is imposed from a physical-chemical viewpoint as well as from that of the heavy metals content.
- Respecting the fabrication recipes is an essential condition for the making of high-quality products.
- The nitrite content from raw-dry products is considerably reduced, almost missing in the finite product, as a consequence of the added or won microorganisms.
- The raw-dry meat products have a nitrate content obtained by using microorganisms or during the process of oxidation, a content which is afterwards used as a nitrite resource.
- The equipping of the fabrication lines with modern items that do not react with the meat composition does not imply changes in the products content in terms of heavy metals: Pb si Cd.

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