

RESEARCH ON THE LEVEL OF NITRATES OF SMOKED PRODUCTS, LASTING SALAMI, BACON

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Abstract

The smoke has beneficial effects on meat products by: bactericidal and / or bacteriostatic action, antioxidant action on fat, flavoring action, color action.

All of this gives a longer stability to the smoked products through the effects mentioned above, but also by decreasing the Aw.

Key words: nitrates, smoked, lasting salami, bacon.

INTRODUCTION

These studies were done on some items as smoked meat products (smoke-dried pork meat, smoke-dried beef meat and smoked ham), on three kinds lasting salami (Choriso, Sibiu and Banat varieties) as raw salami, subject to the processes of maturation and for which nitrates are used and for bacon as specific pork product.

MATERIAL AND METHOD

For these products the M-xylene colorimetric method has been used, in which nitrates and nitrites are determined as total nitrogen and the nitrites are determined separately by the Griess method. The level of nitrates in the product is calculated by the difference between the level of total determined nitrates and the nitrites found and expressed in nitrates equivalent.

The method is based on the M-xylene nitration in acid medium in ortho-nitroxylene, but it is envisaged that this method is influenced by the presence of the nitrites, proteins and chlorides, substances which must be annihilated. To do this, the nitrites are converted into nitrates by oxidation with potassium permanganate (KMnO₄). The chlorides are removed by precipitation with ammoniac silver hydroxide and the proteins by precipitation with 20% phosphotungstic acid solution.

RESULTS AND DISCUSSIONS

In determining the content of nitrates in some smoked meat products during 2008, 20 samples of smoke-dried pork meat, 20 samples of smoke-dried

beef meat and 10 samples of smoked pork ham were examined. The research results are presented in Table no. 1.

Table 1

Values of the residual nitrates in some smoked meat in 2008

Assortment	No. of samples	mg NaNO ₃ /kg		Frequency of exceeding the MRL	
		Limits	Average	A	R
Smoke-dried pork meat	20	40.00-268.00	71.55	1	5%
Smoke-dried beef meat	20	40.00-90.00	58.50	0	0
Smoked pork gammon	10	40.00-90.00	65.00	0	0
Total/Average	50	40.00-268.00	65.02	1	2%

The data show that 5% of the smoked pork samples investigated exceeded the MRL.

During the year 2009 a total of 36 different kinds of smoked meat varieties and bacon were investigated. The results are shown in Table no. 2.

Table 2

The level of nitrate content in smoked meats and bacon in 2009

Assortment	No. of samples	ppm NaNO ₃ /kg		Percentage
		Limits	Average	MRL exceeding
Smoke-dried pork meat	11	40.00-120.00	68.00	0
I Smoke-dried beef meat	10	46.00-100.00	64.60	0
Smoked pork gammon	10	58.00-93.00	77.20	0
Bacon	5	40.00-62.00	53.57	0
Total/Average	36	40.00-120.00	65.69	0

The summary results of the nitrate content in some smoked meats and bacon during 2008 and 2009 is shown in Table no. 3.

Table 3

Nitrate content in some smoked products and bacon

Assortment	No. of samples	mg NaNO ₃ /kg		Frequency of exceeding the MRL	
		Limits	Average	A	R
Smoke-dried pork meat	31	40.00-268.00	68.10	1	3,22%
Smoke-dried beef meat	30	40.00-100.00	60.53	0	0
Smoked pork gammon	20	40.00-93.00	71,10	0	0
Bacon	5	40.00-62.00	53.37	0	0
Total/Average	86	40.00-268.00	65.30	1	1,16%

The data we obtained reveal that for the smoked meat products, the nitrate levels contained were located in most samples investigated under the standard limit. The exception was a sample of pork pastrami.

The data analysis for the 50 samples of smoked meat studied in 2008 (Table 20) revealed that the residual nitrate levels were within the variation range: 40-268 ppm with an average of 71.55 ppm in the smoke-dried pork meat; between 40-90 ppm with an average of 58.50 ppm in the smoke-dried beef meat; between 40-90 ppm and an average of 65 ppm in the smoked pork gammon.

For the three types of smoked meat investigated the average of the nitrate content was 65.02 ppm.

The data obtained for the smoked meat and bacon during 2009 (Table 21), on the nitrate content, showed similar aspects to those seen during 2008. And in this situation relatively large limits of the content of nitrates have been observed within each type of product studied as for the products investigated in 2008.

The average of the nitrates for the products investigated in 2009 had the following values expressed in ppm sodium nitrate:

- 68.00 ppm NaNO₃ in the smoke-dried pork meat;
- 64.60 ppm NaNO₃ in the smoke-dried beef meat;
- 77.20 ppm NaNO₃ in the smoked pork gammon;
- 53.57 ppm NaNO₃ in bacon.

The average of the four types was 65.69 ppm NaNO₃. The average values of the nitrate content in the smoked meat products, on items in both years were:

- 53.57 ppm NaNO₃ in bacon;
- 60.53 ppm NaNO₃ in the smoke-dried beef meat;
- 68.10 ppm NaNO₃ in the smoke-dried pork meat;
- 71.10 ppm NaNO₃ in the smoked pork gammon.

Research on the nitrate content in some types of lasting salami

The results obtained in the two years are shown in Table no. 4.

The data for the year 2008 for the three types of varieties studied showed the following levels of nitrates:

- 35.68 ppm NaNO₃ for the Choriso salami with limits ranged between 18.00-50.00 ppm NaNO₃;
- 41.16 ppm NaNO₃ for the Banat salami with limits ranged between 20.00-61.00 ppm NaNO₃;
- 44.50 ppm NaNO₃ for the Sibiu salami with limits ranged between 38.00-60.00 ppm NaNO₃.

For the year 2009, the residual nitrate levels had the following average values:

- 35.40 ppm NaNO₃ for the Choriso salami with limits ranged between 15.00-50.00 ppm NaNO₃;
- 39.78 ppm NaNO₃ for the Banat salami with limits ranged between 24.00-60.00 ppm NaNO₃;

- 47.12 ppm NaNO₃ for the Sibiu salami with limits ranged between 30.00-69.00 ppm NaNO₃,

Table 4

The average content of nitrates in some sort of lasting salami for the years 2008-2009

Assortment	2008			2009			Total		
	No. of samples	ppm NaNO ₃		No. of samples	ppm NaNO ₃		No. of samples	ppm NaNO ₃	
		Limits	Average		Limits	Average		Limits	Average
Sibiu salami	10	38.00-60.00	44.50	10	24.00-60.00	39.78	20	24.00-60.00	42.14
Choriso salami	5	18.00-50.00	35.68	10	30.00-50.00	35.40	15	18.00-50.00	35.50
Banat salami	5	20.00-61.00	41.16	10	20.00-65.00	47.12	15	20.00-65.00	45.13
Total/Average	20	18.00-61.00	41.46	30	18.00-65.00	40.76	50	18.00-65.00	41.04

For this lasting salami a relatively large variation in the nitrate content limits was seen, with values ranging between 18.00 ppm and 65.00 ppm NaNO₃. The average nitrate content of these meat products, in both years, had the following values:

- 35.50 ppm NaNO₃ for the Choriso salami with limits ranged between 18.00 ppm and 50.00 ppm NaNO₃;
- 42.12 ppm NaNO₃ for the Banat salami with limits ranged between 24.00 ppm and 60.00 ppm NaNO₃;
- 45.13 ppm NaNO₃ for the Sibiu salami with limits ranged between 20.00 ppm and 65.00 ppm NaNO₃.

For all the three ranges investigated the nitrate content level ranged from an average of 41.04 ppm NaNO₃, which is below the MRL value, without meeting MRL exceeding.

CONCLUSIONS

The residual nitrites in meat products, for which the nitrites are used for anti-botulinum and color effects, in certain circumstances depending on the qualities of the meat used, the failure to comply with the prescribed dosage and other factors such as not using ascorbic acid and acerbates simultaneously, can overcome the limits of tolerance for certain products and can induce morbid conditions. The MRL exceeding to about 9% of the meat products, appears as a relatively high percentage which to justify the above statement.

The NDMA, NDEA and NPYR research in some meat products, like salami and sausages with meat maturation and smoked fish, showed tolerable levels both for each nitrosamine and cumulative in each product.

For the smoked meat investigated the nitrates exceeded the MLR in the smoke-dried pork meat, representing 1.10% of the total smoked products and the average values were 53.37 mg NaNO₃/kg in bacon; 60.53 mg

NaNO₃/kg in the smoke-dried beef meat; 68.10 mg NaNO₃/kg in the smoke-dried pork meat and 71.10 mg NaNO₃/kg in the smoked pork gammon.

For the three kinds of raw salami big differences were encountered between the minimum (18.00 ppm NaNO₃) and the maximum limits (65.00 ppm NaNO₃), no MRL exceeding was met and the average of the nitrates has values like: 35.50 ppm NaNO₃ for the Choriso variety salami, 42.14 ppm for the Sibiu salami and 45.13 ppm for the Banat salami.

In the processed meat products like salami and sausages and smoked meat a large variation in the limits of nitrites in all the products studied and in the mean values were observed, by ranges, types of reproduced items and even years.

During the entire period studied (2007-2010) the nitrite content values expressed in mg NaNO₂/kg of product categories were:

- 7.00-111.00 ppm NaNO₂ and an average of 42.57 ppm NaNO₂ in the semi-smoked salami;

- 32.00-81.00 ppm NaNO₂ and an average value of 56.96 ppm NaNO₂ in the lasting salami;

- 5.00-108.00 ppm NaNO₂ and an average of 44.21 ppm NaNO₂ in the smoked meat.

A relatively high percentage of samples of meat products have been inconsistent in terms of content of nitrites, which met the MRL exceeding (70 mg NaNO₂), namely:

- for 5.58% in the samples of semi-smoked salami and on ranges the percentage of the MLR exceeding was 25% for the beef + pork salami, 20% in the pork salami and in the traditional salami, 14.28% in the Trandafir variety sausages and Cabanos variety sausages; 10% in the Debretin variety salami; 8.33% in the venison salami, 7.14% in the summer salami and 3.70% in the Cluj variety sausages.

For the lasting salami the percentage of the nitrite MLR exceeding was of 6.00% overall and on ranges from 10% of the samples of Sibiu salami and 6% in the Choriso salami.

In the 17 kinds of smoked meat examined the nitrite MLR exceeding were met on 11 items, representing 4.01% of the total of 374 samples. In terms of assortment, the MRL exceeding was of 20% in bacon; 10% in boiled pork meat and chicken legs, 6.66% in the Gypsy variety sirloin; 5.45% in the smoke-dried pork meat; 5% in the smoked pork gammon and the smoke-dried chicken meat; 4% in the smoke-dried beef meat; 3.45% in the smoked chops; 3.33% in the sirloin.

In all the classes of meat products and assortments, the percentage of the nitrite MLR exceeding amounted to 9.05% of the samples.

For the product nitrites, for which relatively frequent exceeding of the MRL was met, we propose:

- maintaining the current monitoring of the nitrites in the meat products
- tightening the punitive measures for the processing units in case of nitrite MLR exceeding in the products.

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