POSSIBILITY OF PREVIOUSLY BLANCHED AND CURED BEEF TO BE USED FOR CORNED BEEF PRODUCTION

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Keywords: corned beef, colour, nitrite, curing, blanching

Introduction

The aim of this task was to determine the extent of the chemical reaction between sodium nitrite *i.e.* nitrogen monoxide and denaturated myoglobin in thermally treated / blanched meat at 95-100°C for 15 minutes (Trial 2). Myoglobin was denaturated at 60°C (Hamm, 1996). Corned beef was produced by adding sodium nitrite to the blanched meat. The colour of this product was compared to the colour of a corned beef product produced with the same amount of sodium nitrite that was cured for 48 hours. Composition of raw material and chemical composition of the final product is presented in Tables 1 and 2. Furthermore, amounts of total pigments and nitrosylmyoglobin (NOMb) content were determined (Table 4) and the results of instrumental determination of colour in the final product are presented in Table 3.

Materials and Methods

Water content, proteins, ash and hydroxyproline content were determined according to ISO 1442/1998, ISO 937/1992, ISO 1444/1998, ISO 936/1999 and ISO 3496/2001 methods respectively. Product colour was determined on a Chroma meter CR-400 instrument (Minolta). On the basis of CIE Lab (Robertson, 1977), the following parameters were determined: psychrometric tone-a (level of red colour), psychrometric chroma-b (level of yellow colour) and psychrometric lightness (L). Total pigments content (TP) and nitrosylmyoglobin (NOMb) content were determined by the Möhler modification of the Hornseye's method (1958). In Trial 1, meat of the 1st and 3rd grade was cured with 2% of nitrite salt for 48 hours at +4°C and then blanched. In the second trial, 2.4% of the nitrite salt was added after blanching to the non-cured meat.

Results and Discussion

In Table 1, corned beef composition of both trials is shown. Table 2 (Trials 1 and 2) shows the results of chemical analysis of corned beef. Results indicate that there are no significant differences between maximal and minimal values for any of the examined properties in both Trial 1 and Trial 2. However, these parameters clearly indicate that in both trials high quality products with high nutritional values were obtained. Equal chemical composition of the products in both trials was provided by previous chemical analysis of product ingredients. Therefore, standardised quality has been ensured, not only considering sensory properties, but also the chemical composition. There were no differences in chemical composition and sensory properties between corned beef from meat cured before blanching and corned beef from meat cured immediately after blanching. Table 3 shows the results of instrumental determination of colour in corned beef samples from Trial 1 and Trial 2. Values of psychrometric light indicate that products made from meat that was cured after blanching were of brighter red and exhibited weaker intensity of yellow. However, the parameters clearly indicate that in both cases, the colour of the product was characteristic for cured, thermally treated meat. Most auditors found these properties very acceptable and desirable. Total pigments (TP) content and NOMb content (Table 4.) were significantly higher in corned beef made from meat cured 48 hours before blanching (Trial 1) compared with products cured after blanching *i.e.* before stuffing, formation and filling into the cans (Trial 2). These results confirm the previous observations that the darker red colour achieved in Trial 1 is a consequence of the conversion of higher myoglobin amount into nitrosyl form. However, products from Trial 2 also had a higher percentage of total pigments converted into nitrosylmyoglobin. This provided stable colour, characteristic for cured beef although of slightly brighter hue.

Table 1: Corned Beef Ingredients

Trial 1		Trial 2	
Ingredients	%	Ingredients	%
Cured/blanched beef 1st grade	54.96	Blanched beef 1st grade	53.85
Cured/blanched beef 3rd grade	9.80	Blanched beef 3rd grade	9.61
Blanched tallow	14.72	Blanched tallow	14.42
Cooked beef tendons	11.78	Cooked beef tendons	11.54
Broth	7.85	Broth	7.70
Gelatine	0.49	Gelatine	0.48
Nitrite salt	0,40	Nitrite salt	2.40
Total	**100,00**	**Total**	**100,00**

Table 2: Chemical Composition of Corned Beef (Trial 1 and Trial 2)

	Trial 1			Trial 2		
	minimum	maximum	$\bar{x}$	minimum	maximum	$\bar{x}$
Proteins, %	23.14	23.50	23.34	23.11	23.60	23.35
Fat, %	15.80	16.19	15.99	16.30	17.10	16.70
Water, %	57.63	58.28	57.88	57.50	57.70	57.60
Ash, %	2.61	2.78	2.66	2.50	2.60	2.55
Hydroxyproline, %	0.310	0.326	0.320	0.315	0.326	0.320
Connective tissue, %	2.48	2.61	2.57	2.52	2.61	2.56
Connective tissue-proportion in total proteins, %	10.72	11.11	10.91	10.90	11.06	10.96
Lean meat	104.23	105.86	105.13	104.09	106.31	105.20
Total meat	120.03	122.03	121.12	120.40	123.41	121.90

Table 3: Results of instrumental colour determination in Corned Beef-u (Trials 1 and 2)

	Trial 1			Trial 2		
	L*	a*	b*	L*	a*	b*
I sample	49.59	19.67	13.76	53.16	17.35	12.59
II sample	49.53	18.80	13.39	55.90	15.47	12.33
III sample	50.04	20.84	14.57	51.72	18.55	13.32
Average value	49.72	19.77	13.91	53.59	17.12	12.75
SD	0.28	1.02	0.60	2.12	1.55	0.51

L* - psychrometric light – samples with higher L* values are brighter
a* - psychrometric tone: positive a* values correspond to red.
Higher a* values correspond to higher intensity of red
b* - psychrometric chrome: positive b* values correspond to yellow.

Table 4: Content (μg/g) of total pigments (TP) and nitrosylmyoglobin (NOMb) in Corned Beef

	TP	NOMb
Trial 1	297.84	164.72
Trial 2	203.32	118.03

The results indicate that in blanched meat (thermally treated at 95-100°C), some of the pigments remain and react with nitrites creating thestable light red colour characteristic of cooked cured beef. The fact remains that thermally treated non-cured beef contains less pigment, however, the level of nitrosylmyoglobin is higher in this type of product. This relation is important for formation of desirable colour and other properties significant from a sensory point of view.

Conclusions

Beef, thermally treated in water at 95-100°C, achieved desirable and stable colour by the reaction of pigments with curing (nitrite) salt.

Technology of blanching the non-cured meat and subsequent addition of nitrite salt in the production of corned beef considerably shortens the production process and provides energy savings.

Acknowledgments

Data published in this paper was acquired from the Project № BTN-351001B financed by the Ministry of Science and Environmental Protection of Republic of Serbia.

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