INFLUENCE OF PROCESSING AND ONE-YEAR STORAGE ON BIOLOGICAL VALUE OF CANNED LUNCHEON MEAT PORK

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SUMMARY

Luncheon meat pork cans were investigated microbiologically, sensorically and chemically after having been sterilized and stored for one year. Selected parameters characterizing biological value are assessed in relation to raw material state prior to its thermal processing. Biological value (content of dry matter, fat, proteins, amino acids and fatty acids) was found not to have changed significantly even due to one-year storage. The pH value, fat constants, contents of ammonia and/or linoleic acid seemed to be suitable analytical parameters for the quality control. It was also found that neither in the course of sterilization nor after one-year storage did significantly decrease the content of BHC, DDT and PCB residues.

INTRODUCTION

Ever growing standards have been set for the preparation of cans. Biological value and expiration period of cans depend on many factors affecting both the production and storage. Choice of raw material, production technology, packaging material and post production treatment are of decisive significance. Thermal schedule of the can production would guarantee liquidation of thermally resistant microorganisms and enzymic inactivation with careful processing of canned material. However, in the course of thermal processing, different forms of interactions among various components of raw materials occur. Neither the canned luncheon meat pork may be considered to be the product which will not change and which need not be paid special attention.

MATERIAL AND METHODS

Canned luncheon meat pork was produced under common conditions (about 30 % of beef, 70 % of pork, 2 % of salting mixture containing 0.5 % of nitrite, 5 % of wheat flour and spices). The mass of the content of one can was 850 g. The packaging was made of welded sheet metal in dimensions of 99 x 118 mm. Sterilization was being performed at the temperature of 121 °C for the period of 90 minutes. Having been produced, the cans were stored at the maximum temperature of 15 °C and relative humidity of 75 % for the period of one year.

A mixture of raw material was subjected to analysis prior to its being filled into the cans (group 1), then the contents of cans were analyzed within two days after the end of production (group 2) and after one-year storage (group 3), respectively.

Dry matter and ashes were determined gravimetricly, fat was determined by diethyl ether extraction and the total nitrogen was determined by microkjeldahlization (protein calculated with the aid of a factor of 6.25). Further were determined contents of salt and ammonia and pH values. Acidity, iodine and peroxide values were determined in fat. Essential amino acids were determined by ion exchange chromatography, tryptophan and hydroxyproline were determined spectrophotometrically. Fatty acids and residues of organochlorine type were determined by gas chromatography, trace elements were determined by atomic absorption spectrophotometry.

RESULTS

Microbiological and sensorical investigations met the demands on the valid standard for cans of this type and they are therefore not summarized in separate tables.

Of the basic can quality parameters (Table 1) the content of ammonia increased after sterilization and further slightly more after one-year storage. The resulting ammonia content of 32.3 mg/100 g does not exceed the recommended value of 36 mg/100 g. The pH value increased after the sterilization and stabilized at the value of 6.24 after one-year storage. Fat constants mostly showed the values improving after the sterilization as well as after one-year storage.

No conclusive differences were found in the content of amino acids either after the sterilization or after one-year storage, similarly as in those of fatty acids (Table 3) with the only exception for linoleic acid whose content decreased significantly after one-year storage. The content of trace elements (Table 4) was balanced in all stages, including acceptable content of tin even after one-year storage, obviously thanks to the use of welded instead solded sheet metal cans. The contents of chlorocarbons and PCB are summarized in Table 5. In the course of thermal processing a slight decrease occurred in the sum of BHC whereas the sums of DDT and PCB remained unchanged. After one-year storage both the sum of BHC and that of DDT were slightly reduced without any change in the content of PCB.

CONCLUSIONS

Experimental results confirmed that neither in the course of thermal processing nor even after one-year storage of canned luncheon meat pork did occur any significant decrease in its biological value. Besides microbiological and sensorical investigations, pH value, fat constants and content of ammonia and/or linoleic acid appear to be suitable analytical parameters for quality control.

TABLE 1: BASIC QUALITY PARAMETERS

Sample / Parameter	Group 1 $\bar{X}$	Group 1 S	Group 1 Sr	Group 2 $\bar{X}$	Group 2 S	Group 2 Sr	Group 3 $\bar{X}$	Group 3 S	Group 3 Sr
Dry matter %	41.29	0.71	1.71	40.34	0.61	1.50	42.38	0.42	0.99
Ashes %	2.34	0.13	5.40	2.30	0.08	3.39	2.23	0.05	2.44
Fat %	19.83	0.92	4.64	18.40	0.63	3.40	20.00	0.63	3.15
Protein %	14.42	0.79	5.49	14.24	0.66	4.61	14.20	0.32	2.23
Na Cl %	2.45	0.06	2.45	2.89	0.32	11.14	1.80	0.09	4.99
Ammonia mg/100 g	13.05	3.42	26.19	30.94	2.51	8.11	32.30	4.60	14.25
pH	6.73	0.03	0.47	6.91	0.02	0.30	6.25	0.02	0.31
Acid value	1.81	0.22	12.40	1.51	0.24	16.16	1.21	0.03	2.15
Iodine value	55.46	1.96	3.53	54.53	1.85	3.39	56.18	1.33	2.36
Peroxide value	13.76	1.08	7.89	10.38	0.45	4.35	8.93	0.40	0.50

TABLE 2: PARAMETERS OF AMINO ACIDS in g . $(16\ gN)^{-1}$

Amino acid	Group 1			Group 2			Group 3		
	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr
Thr+	4.29	0.25	5.83	3.99	0.22	5.53	4.43	0.14	3.23
Val+	4.71	0.33	7.05	4.63	0.27	5.83	5.37	0.17	3.25
Met+	2.43	0.21	8.58	2.46	0.14	5.69	2.76	0.11	4.12
Ile+	4.16	0.29	7.06	4.15	0.27	6.60	4.73	0.12	2.55
Leu+	7.30	0.47	6.45	7.50	0.42	5.62	8.31	0.26	3.10
Phe+	3.91	0.24	6.07	4.02	0.21	5.13	4.32	0.16	3.51
Lys+	7.91	0.46	5.81	7.67	0.44	5.72	8.42	0.28	3.37
Trp+	1.67	0.09	5.55	2.03	0.16	8.11	1.60	0.16	10.08
Hyp	3.79	0.60	15.73	3.57	0.22	6.19	3.65	0.28	7.78

+ Essential amino acids

TABLE 3: CONTENT OF FATTY ACIDS in rel. % IN CANS AND IN THE MASS OF LUNCHEON MEAT PORK

Fatty acid	Group 1			Group 2			Group 3		
	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr
16:0	26.39	1.66	7.11	25.22	2.07	8.20	26.15	0.99	3.79
16:1	3.44	0.47	13.72	3.66	0.48	12.06	4.04	0.55	13.66
18:0	12.24	0.80	6.53	12.37	0.55	4.41	11.97	1.12	9.33
18:1 +	44.53	1.81	4.07	42.04	1.53	3.65	44.19	1.89	4.28
18:2 +	5.38	0.37	6.85	5.63	0.25	4.47	4.53	0.56	12.39

+ Essential fatty acid

TABLE 4: CONTENT OF TRACE ELEMENTS in mg . kg^{-1}

Element	Group 1			Group 2			Group 3		
	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr	$\bar{X}$	S	Sr
Cadmium	0.016	0.005	29.358	0.017	0.004	21.592	0.015	0.005	34.247
Lead	0.134	0.033	24.563	0.122	0.023	18.568	0.112	0.029	25.619
Mercury	0.012	0.003	24.801	0.011	0.003	27.574	0.011	0.002	17.985
Zinc	23.687	2.376	10.031	22.944	2.220	9.677	22.112	1.941	8.778
Tin	2.251	0.834	37.047	2.438	1.164	47.743	+.466	0.492	33.530

TABLE 5: CONTENT OF CHLOROCARBONS AND PCB
in mg . kg^{-1} (relative to fat)

Group	Σ BCH	Σ DDT	PCB
1	0.10	0.17	0.08
2	0.10	0.17	0.08
3	0.09	0.15	0.08