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QUALITY AND HEALTH SAFETY OF MEAT CANS

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SUMMARY

The paper shows the results of the chemical, microbiological and research of the heavy metals findings of meat cans produced in two different production plants. The producer A had the HACCP system already implemented, as opposed to the producer B who was just starting to implement the system. 3,7% of all the analyzed samples, products of the producer B, were objected to during the control and storing. The reasons were aberration in the quality of a product (increased quantity of water and fat), separation of fat from the content of a product, appearance of hollows in the content and corrosion on the lid, seams and the cape of the can. There has also been determined an increased quantity of added polyphosphates in products of the producer B, which affects the safety of products. There were no objections on products of the producer A

during purchase and storing. All the researched samples of both producers were microbiologically safe. According to the results of heavy metals in cans with chopped meat of both producers, zinc, tin, lead and arsenic were determined.

Key words: meat cans, quality, health safety

INTRODUCTION

Department of Quality Control of the Service for Reception and Support of the Ministry of Defense of the Republic of Croatia performs controlling of the meat products' quality at centralized program of supply at the producer (supplier), and according to the Regulation on the mode of material providing of the Croatian Armed Forces (National Gazette 179/04) in accordance with the Instruction of controlling the quality of material means and services in the

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▼ **Table 1.** Results of the chemical analysis of “Luncheon meat for a sandwich 100g”, producer B

Series	water %	fat %	proteins %	NaNO ₂ mg/kg	Added phosphates expressed as P ₂ O ₅ , mg/kg	Series	water %	fat %	proteins %	NaNO ₂ mg/kg	Added phosphates expressed as P ₂ O ₅ , mg/kg
1.	55.10	25.00	15.35	16.72	4763	21.	55.11	18.62	-	-	4448
2.	55.73	24.13	16.00	23.13	4400	22.	59.19	13.85	-	-	4066
3.	55.16	24.73	15.65	25.14	5035	23.	60.97	15.83	-	4.70	3000
4.	55.95	23.95	16.00	16.26	4781	24.	53.81	34.21	-	-	-
5.	59.77	23.87	-	-	-	25.	54.38	25.69	-	-	-
6.	55.02	25.16	13.95	15.40	5010	26.	58.24	19.59	-	3.82	2000
7.	55.13	24.83	14.70	33.50	5050	27.	55.80	26.3	14.35	24.50	3230
8.	55.16	24.90	15.13	30.20	4920	28.	54.96	19.86	-	-	-
9.	55.10	25.10	15.40	17.00	4890	29.	56.05	23.49	-	3.63	2200
10.	55.85	24.85	16.40	21.10	4590	30.	54.92	25.95	13.90	23.90	3840
11.	55.19	23.45	13.85	16.75	4630	31.	55.93	24.10	15.00	25.16	4120
12.	54.41	23.79	13.51	8.69	-	32.	55.43	25.16	14.85	25.03	3120
13.	58.61	-	-	-	-	33.	55.03	18.38	-	-	-
14.	54.30	24.90	14.90	18.30	5010	34.	55.21	25.79	-	-	-
15.	57.17	20.19	-	4.09	3000	35.	55.00	20.8	13.82	10	4809
16.	55.07	20.06	-	-	3905	36.	49.20	19.9	14.08	10.5	4580
17.	60.76	12.63	-	-	3986	37.	49.70	19.5	14.10	10	4595
18.	55.68	27.40	13.45	17.18	3510	38.	49.80	19.1	13.60	9.8	4585
19.	58.87	-	-	-	-	39.	49.60	19.7	15.20	11.3	4720
20.	56.00	27.95	12.90	16.57	3820	40.	49.90	20.0	14.90	10.11	4830

Ministry of Defense and Croatian Armed Forces. Military Veterinary Inspection of the Croatian Armed Forces performs the controlling of meat and meat products at the decentralized program of supply and controlling inside the Croatian Armed Forces, and in accordance with the Regulation on the Work Organization of the Military Veterinary Inspection of the Croatian Armed Forces (Pinter, 2008). The goal of this work was to evaluate the quality and health safety of canned meat (luncheon meat for a sandwich) from two different producers, sampled during the period of three years and to determine causes of complaints towards the producer during their storage or

usage. The cans were being purchased for the needs of the Ministry of Defense and the Croatian Armed Forces.

MATERIAL AND METHODS

During the period of three years there were six controls of quality of the product “luncheon meat for a sandwich 100g” (totally 1.117.976 pieces) at the producer A, and at the producer B there were four quality controls (totally 653.000 pieces). Only hygienically faultless cans were stored, which was confirmed by the results of the laboratory researches performed at the producer's or in the

licensed laboratories where they were researched on the customer's demand. 145 collective samples of certain production series were excepted. The producer A had a HACCP system already implemented, as opposed to the producer B who was just starting to implement the system.

During the control and storing of the cans in the Croatian Armed Forces, sensory researches were performed, and the excepted collective samples were analyzed in microbiological, chemical and research for heavy metals findings.

Microbiological analysis included the following parameters: the total count of *aerobic mesophyllic bacteria* in 1g of a sample; *Salmonella spp.* in 25 g of a sample; *Staphylococcus aureus* in 1g of a sample; *sulphite-reducing clostridia* in 1g of a sample; *Enterococcus spp.* in 1 g of a sample; *Listeria monocytogenes* in 25 g of a sample. Regular research procedures were used according to HRN ISO standards. The results were interpreted according to the Regulation on the Microbiological Standards for Food (Anon., 2003).

A quantity of water, fat, proteins, a quantity of nitrites, phosphates and NaCl was determined in chemical analysis. The procedures according to HRN ISO standards were used in the analysis.

The research on the heavy metal findings in meat cans

was performed according to the method of atomic absorption spectrophotometric (AAS). The results were interpreted in accordance with the existing regulations (Anon., 2003; 2005).

RESULTS AND DISCUSSION

“Luncheon meat for a sandwich 100g”, producer A

Samples of the producer A contained in average between 50,94 and 54,97 % of water and between 23,78 and 29,72 % of fat, while added phosphates expressed as P_2O_5 ranged from 0,119 to 0,220 %. The average content of $NaNO_2$ was at the highest 0,40 mg/100g. The determined quantity of salt ranged from 1,52 to 2,25 %.

“Luncheon meat for a sandwich 100g”, producer B

In the content of products of certain batch determined quantity of water by chemical analysis ranged from 49,20 to 60,97 %, of fat from 13,85 to 34,21 % and of proteins from 12,90 to 16,40 %. Determined quantity of $NaNO_2$ and P_2O_5 ranged from 12,90 to 33,50 mg/kg and from 2000 to 5050 mg/kg, respectively (Table 1.). According to the former Regulation on the Quality of Meat Products, the results of the chemical analysis would indicate a slight aberration in quality because of the increased quantity of water which, according to the valid Regulation on the Meat

▼ **Table 2.** Results of the tests on heavy metals of the “Luncheon meat for a sandwich 100g”, of the producers A and B in mg/kg

Series	Cadmium	Lead	Arsenic	Mercury	Zinc	Tin
producer A						
1.	0.013	< 0.01	< 0.001	< 0.01	16.79	< 1
2.	< 0.01	< 0.01	0.06	< 0.01	-	-
producer B						
3.	0.01	0.01	< 0.1	< 0.02	16.62	0.06
4.	< 0.005	< 0.05	< 0.002	< 0.02	15.6	< 0.002
5.	< 0.005	< 0.05	< 0.002	< 0.002	18.9	< 1
6.	< 0.005	< 0.05	< 0.002	< 0.002	14.6	< 1
7.	< 0.005	< 0.05	< 0.002	< 0.002	15.9	< 1
8.	0.01	0.01	< 0.10	< 0.02	14.16	0.27
9.	0.01	0.01	0.1	< 0.02	16.29	0.05
10.	0.01	0.01	< 0.1	< 0.02	17.14	0.26

▼ **Table 4.** The entire quantity of researched and irregular cans of “Luncheon meat for a sandwich” of the producers A and B

Product	Quantity, pieces	Irregular	%
Luncheon meat for a sandwich 100 g - producer A	1.117.976	-	-
Luncheon meat for a sandwich 100 g - producer B	653.000	66.417	10,0

Products (National Gazette 1/07), is no longer a parameter in determining the quality of a product, but the quantity of fat and proteins. Still, in products of the producer B there was determined an increased quantity of added polyphosphates (> 5000 mg/kg) in four production batch of samples, which affects the health safety of a product (Živković, 1986; Kovačević, 2001; Anon., 2004).

During the microbiological research of samples of the producers A and B there wasn't determined even one case of an increased number of *aerobic mesophyllic bacteria*, as well as there weren't any findings of the bacteria of *Salmonella* genus in 25 g and *Enterococcus* in 1 g, sulphite-reducing *clostridia* in 1g or bacteria *Listeria monocytogenes* in 25 g.

The results of tests on heavy metal findings were in accordance with the regulations on allowed quantities for the listed product (Anon., 2003; 2005), and zinc, tin, lead and arsenic were determined (Table 2.).

During the period of three years from the entire quantity of the product “Luncheon meat for a sandwich” of the producer B, based on the researched samples from certain production series, there were determined 66.417 pieces or 10% of irregular cans because of an aberration in the quality of a product, which makes 3,7% in relation to the entire number of the researched cans of both producers.

During the control of quality at the producer B, there was determined a slight external corrosion on edges of a can and on a ring pull can opener. Then the sensory evaluation (Živković, 1986; Roseg et al., 1995) determined separation of fat from the content of a product, appearance of hollows in the content because of the insufficient filling of cans, appearance of corrosion on the lid, seams and the cape of a can. The determined causes of irregularity were also aberration in the quality of a product (increased quantity of water, increased quantity of fat). The increased quantity

of polyphosphates, probably added in the process of production by inattention or in the goal of improvement of the sensory quality of a finished product, affected the health safety of a product.

There weren't any complaints during the purchase and storage of the same products of the producer A.

The results impose the conclusion that one of the reasons for complaints to the producer B because of mistakes and the unsatisfying quality of meat cans was also a fact that they don't have ISO 9001 or ISO 22000 systems implemented, and the HACCP system was in the process of implementation, as opposed to the producer A. Instead of a conclusion, it should only be mentioned that the listed procedures for safety of food production of the producer A have shown the effect. Still, on the other hand, the experts of the Department of Quality Control at the Ministry of Defense of the Republic of Croatia and the Veterinary Inspection of the Croatian Armed forces recognized that difference, so in the context of their assignments they made the choice of faultless products.

ZUSAMMENFASSUNG QUALITÄT UND GESUNDHEITLICHE RICHTIGKEIT VON FLEISCHKONSERVEN

In dieser Arbeit sind Resultate chemischer und mikrobiologischer Untersuchungen, sowie Untersuchungen auf Schwermetalle der Fleischkonserven dargestellt, die in zwei verschiedenen Betrieben hergestellt wurden. Der Hersteller A hatte das HACCP System implementiert gehabt, zum Unterschied vom Hersteller B, der das System erst einführte. Bei der Aufsicht und während der Lagerung wurde hinsichtlich Qualität und gesundheitlicher Richtigkeit in 3,7 % aller geprüften Muster des Herstellers B Einspruch erhoben. Die Gründe dafür waren Abweichungen hinsichtlich der Produktqualität (größerer Anteil von Wasser und Fett), Ausscheiden von Fett aus dem Produktinhalt, Entstehung von Höhlungen im Inhalt, Korrosion am Deckel, Nähten und Konservenmantel. Bei den Produkten des Herstellers B wurde größere Menge der zugefügten Polyphosphate festgestellt, was auf gesundheitliche Richtigkeit des Produktes einen Einfluss hat. Auf gleiche Produkte des Herstellers A wurden gelegentlich der Anschaffung und Lagerung keine Bemerkungen gemacht. Alle untersuchten Muster von beiden Herstellern waren mikrobiologisch richtig. Den Resultaten der Untersuchungen auf Schwermetalle kann man in Fleischkonserven mit Hackfleisch die Präsenz von Zink, Zinn, Blei und Arsen entnehmen.

Schlüsselwörter: Fleischkonserven, Qualität, gesundheitliche Richtigkeit

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QUALITY OF SEA BASS MEAT DURING STORAGE ON ICE

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SUMMARY

The goal of this work was to determine the sustainability of the sea bass meat during its storage on ice in the period of twelve days by following sensory, physical- chemical and microbiological parameters of quality and hygienic safety. Thirty sea basses were researched for that goal on the 2nd, 4th, 6th, 9th and 12th day of storage on ice at 3° C. Sensory grade of quality was evaluated by Quality Index Method test (QIM) created for sea bass, Dicentrarchus labrax (Icelandic Fisheries Laboratories) and Market test. Fish samples were researched on the total count of aerobic mesophilic bacteria, psychrotrophic bacteria and Pseudomonas spp. There were also measured pH- values and the quantity of ammonia. The quantity of ammonia was increasing during the storage of fish and in that manner it was following its sensory characteristics, so the fish samples at the end of our research were evaluated as fish

at risk of rotting with 16.1 mg% of ammonia. Together with the increase of aberration from the characteristic appearance and smell of fresh sea bass, the number of psychrotrophic bacteria and Pseudomonas spp was increasing concurrently.

Key words: shelf life, sea bass meat, quality

INTRODUCTION

Fish has always had an important place in human nutrition and it was a desirable foodstuff not only because of its gastronomic characteristics but also because of the fact that it is food of high nutritional values. First of all, it applies to fish proteins whose value primary lies in easy digestion, better usability and more appropriate amino acid composition, especially when it comes to essential amino acids. Fish fats contain from 60- 84% of unsaturated fatty acids, and beside that, fish is rich in vitamins

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