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RISK-ORIENTED CONTROL OF FISH PRESERVES РИЗИК-ОРІЄНТОВАНИЙ КОНТРОЛЬ РИБНИХ ПРЕСЕРВІВ

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Abstract. *In Ukraine, various preserves are made from the fish of the special ambassador in accordance with the requirements of DSTU 19588:2009 according to the technological instructions in compliance with the State sanitary rules and regulations. Organoleptic, physico-chemical and microbiological indicators, as well as the content of toxic elements, radionuclides in preserves from special ambassador fish of various domestic producers, which were sold in supermarkets of the Kyiv region, were established. In preserves made from zander, hamsa, Black Sea flounder, and Far Eastern capelin, the quality indicators met the requirements and standards established in DSTU 19588:2009. The researched fish preserves of the special ambassador met the regulated safety indicators according to regulatory documentation.*

Key words: *risk-based control, preserves, raw fish, special ambassador, quality, safety.*



Introduction.

Fish and fish products are of great importance in human nutrition and make up a significant part of their diet [1]. In many countries of the world, fish is the main object of the food industry [2, 3]. In our country, the Law of Ukraine "On fish, other aquatic living resources and food products from them" is in force, which defines the main legal and organizational principles for ensuring the quality and safety of fish, other aquatic living resources, and food products made from them for life and health population and prevention of negative impact on the environment in case of catching, processing, packaging and movement across the customs border of Ukraine [4].

The State Production and Consumer Service of Ukraine, which carries out risk-based control over the safety and quality of food products, in particular fish preserves, must comply with the requirements of the new European regulations on food products, the Codex Alimentarius Commission, FAO/WHO, the main provisions of the SPS and TBT trade agreements and organize its work on based on food safety risk assessment [5]. The HACCP system, which is based on the fulfillment of the requirements of DSTU 4161–2003 [6], which included the general principles of the functioning of the system, as well as the requirements of the Regulation of the European Parliament and the Council of the EU No. 852/2004, is recognized as the most effective method of ensuring the safety of food products in the world [7].

The fishing industry supplies the population with a wide range of products. Thus, in Ukraine, preserves are made from special ambassador fish in accordance with the requirements of DSTU 19588:2009 [8] according to the technological instructions in compliance with the State sanitary rules and norms [9].

1. Purpose of the work, material and methods of testing fish preserves

The purpose of the work was to carry out risk-oriented control of fish preserves of the special ambassador according to quality and safety indicators.

Material and test methods. In the supermarkets of the Kyiv region "Furshet", "Nash Kray", "Silpo" were selected packaging units of preserved fish of the special ambassador: "Salak of the special ambassador", "Tyulka of the special ambassador", "Hamsa of the special ambassador" (manufacturer LLC "Rybopererobny Zavod" Pleiady", Kyiv Region), "Mathieu Herring Fillet in Marinade" (producer of TOO "GALS-2000", Chernivtsi Region), "Several Black Sea Special Ambassadors" (producer of LLC "Vodny Mir", Odesa Region), " Far Eastern cape of the special ambassador" (producer LLC "Aquafrost", Odesa region). Organoleptic and physical indicators of fish preserves from the special ambassador were determined according to GOST 7631–85 [10]; chemical indicators - according to GOST 7636-85 [11]; MAFAnM content – according to GOST 10444.15–94 [12]; presence of BGKP (coliform bacteria) – according to GOST 30518-97 [13]; the presence of sulfite-reducing clostridia in 1 g of product - according to GOST 29185-91 [14]; presence of staphylococci in 1 g of product - according to GOST 10444.2–94 [15]; the presence of pathogenic microorganisms: *Salmonella* in 25 g of products - according to DSTU EN 12824–2004 [16], *Listeria* – DSTU ISO 11290-2–2003 [17]. The content of radionuclides ^{137}Cs та ^{90}Sr in fish preserves was determined according to Hygienic Standards 6.6.1.1-130–2006 [18]; of toxic elements - according to the current regulatory documentation in the production laboratory of the SE "Kyiv Regional



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2. Organoleptic, physical and chemical parameters of fish preserves

Fish preserves from special ambassador were made from unprocessed or decapitated raw fish, sprinkled with a mixture of salt, sugar, food additive (preservative), placed in cans with or without the addition of saline solution. Supermarkets of the Kyiv region sell a variety of preserves made from special ambassador fish. First of all, it is important to establish the appearance of fish preserves in packaging and the products themselves: glass cans, cans made of polymer materials, polyethylene buckets and fish raw materials for making preserves not lower than the first grade, clean, without damage (table 1).

Table 1 - Organoleptic and physical indicators of fish preserves

The name of the product indicator	Characteristics of products
Appearance of fish and filling: «Salaka of the special ambassador»	Whole, the surface is clean. The presence of fat secretion and protein plaque. Minor skin damage (3%). The filling is liquid with the presence of particles of protein origin, separate scales and fat on the surface.
«Tyulka of the special ambassador»	Whole, the surface is clean. Sticking together of individual fish, when it is possible to separate them without damaging the skin. The filling is liquid with the presence of particles of protein origin.
«Hamsa of the special ambassador»	Whole, the surface is clean. The presence of protein plaque. The filling is liquid with the presence of particles of protein origin, scales and fat on the surface.
«Herring "Mathieu" fillet in marinade»	Whole, the surface is clean. No fat release. Minor skin damage (2%). The filling is liquid with the presence of fat on the surface.
«Several Black Sea special ambassadors»	Whole, the surface is clean. Without the release of fat and protein plaque. Minor skin damage (4%). The filling is liquid with the presence of particles of protein origin.
«Cape Far Eastern Special Ambassador»	Whole, the surface is clean. Fat secretion. Sticking together of individual fish, when it is possible to separate them without damaging the skin. The filling is liquid with the presence of scales and fat on the surface.

Characteristics of fish development: Pikeperch, capelin – decapitated, caviar, milk and partially internal organs are left behind; other fish species are not developed; color – characteristic of this type of fish; the presence of scales – there are some remnants of scales in all types of preserves; the smell is pleasant, characteristic of the ripe fish of the special ambassador, without extraneous smell; consistency – all types of preserves are tender, juicy, sometimes dense (hamsa, tyulka); the taste is pleasant, characteristic of the ripe fish of special salt, without extraneous aftertaste; the presence of extraneous impurities was not detected.



An important organoleptic indicator of preserves is the order of placing fish in the consumer container. Zander and capelin are placed in polymer cans in parallel rows, in a row each fish is in relation to the neighboring one - the main part to the tail. Tulka, hamsa, several, herring "Mathieu" are placed in glass jars vertically along the height of the jar, with the side facing the wall so that the tail parts of the fish cover the main parts below the lying fish. The length of the fish was also determined: zander – 9.1 ± 0.4 cm; fillets, herring slices – 4.5 ± 0.5 cm; khamsy – 6.8 ± 0.5 cm; Far Eastern capelin – 9.5 ± 0.6 cm; black sea pearl – 6.7 ± 0.4 cm.

According to organoleptic and physical parameters, fish preserves of the special ambassador met the requirements of DSTU 19588:2009.

According to risk-oriented control during the production of preserves, their chemical indicators are determined (table 2).

Table 2 - Chemical indicators of fish preserves from the special ambassador

product name	Characteristic			
	mass fraction of constituent parts: fish/fillings, %	mass fraction of fat, %	mass fraction of sodium chloride, %	mass fraction of sodium benzoate, %
«Salaka of the special ambassador», n=6	90,1/10,0	4,2±0,34	6,2±0,62	0,05±0,004
«Tyulka of the special ambassador», n=8	85,2/8,9	3,2±0,14	4,6±0,02	0,07±0,003
«Hamsa of the special ambassador», n=7	85,3/10,1	9,2±1,08	6,8±0,33	0,45±0,004
«Herring "Mathieu" fillet in marinade», n=6	85,5/6,7	6,6±0,39	7,4±0,82	0,065±0,002
«Several Black Sea special ambassadors», n=8	86,0/10,3	3,3±0,16	6,5±0,42	0,09±0,002
«Cape Far Eastern Special Ambassador», n=8	88,9/7,2	6,3±0,48	5,9±0,62	0,075±0,003

From the data in Table 2, it can be seen that the lowest content of sodium chloride was found in "Tyulka of the special ambassador" - 4.6% (according to the norms according to DSTU 19588:2009 – 6–8%). The mass fraction of components in fish preserves/fillings is somewhat disturbed. So, in "Tyulka of the Special Ambassador" - 8.9% is filling (according to norms, at least 10%); in "Moiva Zhirnya Special Ambassador" – 6.7% is filling (according to the norm, at least 7%). A particularly important indicator in fish preserves of the special ambassador, the preservative -



sodium benzoate, was within the norm according to DSTU 19588:2009 – no more than 0.1%.

3. Microbiological indicators and content of toxic elements and radionuclides in fish preserves

The safety of fish preserves is confirmed by tests on microbiological indicators, the content of toxic elements and radionuclides (table 3, 4).

Table 3 - Microbiological indicators of fish preserves

product name	Characteristic	
	content of MAFAnM, CFU/g*	BGKP (coliform bacteria); <i>Sulfite-reducing Clostridia</i> , <i>Staphylococci</i> , <i>Salmonella</i> , <i>Listeria</i>
«Salaka of the special ambassador», n=6	$(7,66 \cdot 10^2) \pm 30,1$	not detected
«Tyulka of the special ambassador», n=8	$(3,21 \cdot 10^2) \pm 52,6$	not detected
«Hamsa of the special ambassador», n=7	$(4,43 \cdot 10^2) \pm 29,6$	not detected
«Herring "Mathieu" fillet in marinade», n=6	$(7,52 \cdot 10^2) \pm 28,8$	not detected
«Several Black Sea special ambassadors», n=8	$(5,20 \cdot 10^2) \pm 35,2$	not detected
«Cape Far Eastern Special Ambassador», n=8	$(3,86 \cdot 10^2) \pm 28,9$	not detected

Note. * – permissible normative content of MAFAnM – $1,0 \cdot 10^3$ CFU/g.

The lowest content of MAFAnM was found in "Tyulka special ambassador" preserves – $(3,21 \cdot 10^2) \pm 52,6$ CFU/g, "The Far Eastern cape of the special ambassador" – $(3,86 \cdot 10^2) \pm 28,9$ and "Khamsa of the special ambassador" – $(4,43 \cdot 10^2) \pm 29,6$ CFU/g. In the products of other types of preserves, the content of MAFAnM was slightly increased, especially in "Special ambassador salad" – $(7,66 \cdot 10^2) \pm 30,1$ CFU/g and "Mathieu herring fillet in marinade" – $(7,52 \cdot 10^2) \pm 28,8$ CFU/g.

Table 4 - Content of toxic elements and radionuclides in preserved fish

product name	Safety indicators					
	Lead, mg/kg	Cadmium, mg/kg	Arsenic, mg/kg	Mercury, mg/kg	^{137}Cs , Бк/кг	^{90}Sr , Бк/кг
«Salaka of the special ambassador», n=6	0,45±0,02	0,14±0,01	4,46±0,14	0,21±0,02	76,5±4,6	27,2±2,6
«Tyulka of the special ambassador», n=8	0,58±0,02	0,09±0,01	3,42±0,18	0,28±0,04	66,5±4,2	18,5±4,2



«Hamsa of the special ambassador», n=7	0,42±0,01	0,11±0,01	2,57±0,16	0,26±0,04	58,4±3,8	21,4±4,4
«Herring "Mathieu" fillet in marinade», n=6	0,29±0,01	0,12±0,01	3,16±0,20	0,31±0,02	52,2±4,0	26,2±4,5
«Several Black Sea special ambassadors», n=8	0,68±0,02	0,17±0,01	4,22±0,18	0,21±0,04	81,1±3,8	34,8±3,8
«Cape Far Eastern Special Ambassador», n=8	0,42±0,01	0,15±0,01	2,44±0,14	0,24±0,02	74,9±4,2	22,4±3,3
Norms	1,0	0,2	5,0	0,4	130	100

The content of toxic elements in the studied preserves from the fish of the special ambassador was within the permissible levels according to DSTU 19588:2009, and radionuclides ^{137}Cs та ^{90}Sr – did not exceed the permissible levels established by the Hygienic Norms 6.6.1.1-130–2006 [18].

Conclusions.

Issues of safety and quality of fish preserves under risk-oriented control by veterinary medicine specialists were considered.

Data were obtained that in fish preserves "Salak of the Special Ambassador", "Hamsa of the Special Ambassador" (producer of LLC Pleiady Fish Processing Plant, Kyiv Region), "Several Black Sea Special Ambassador" (producer of LLC "Vodny Mir", Odesa region) and "Moyva dalekshkhidna special ambassador" (producer LLC "Aquafrost", Odesa region) organoleptic, physico-chemical indicators met the regulatory requirements of DSTU 19588:2009; the safety indicators (MAFAnM content, toxic elements, radionuclides) of the studied fish preserves of the special ambassador of all manufacturers met the requirements established by regulatory documents and hygienic standards.

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Ministry of Health of Ukraine on 03.05. 2006, No. 256.

Анотація. Пресерви з риби спеціального посолу були виготовлені із нерозробленої або обезглавленої риби-сирцю, пересипаної сумішшю солі, цукру, харчової добавки (консерванту), укладені в банки з додаванням або без додавання сольового розчину. Супермаркети Київської області реалізують різноманітні пресерви з риби спеціального посолу. Насамперед важливо встановити зовнішній вигляд пресервів із риби в упаковці та самих виробів: скляні банки, банки із полімерних матеріалів, поліетиленові відеця та рибна сировина для виготовлення пресервів не нижче першого татунку, чиста, без пошкоджень. Салака та мойва вкладена в полімерні банки паралельними рядами, у ряду кожна рибина стосовно сусідньої – головною частиною до хвостової. Тюлька, хамса, кільки, оселедець «Матъє» вкладені у скляні банки вертикально по висоті банки, боковою стороною до стінки так, щоб хвостові частини риб прикривали головні частини нижче лежачих риб. Також була встановлена довжина риби: салаки – $9,1 \pm 0,4$ см; тюльки, оселедця ломтиками – $4,5 \pm 0,5$ см; хамси – $6,8 \pm 0,5$ см; мойви далекосхідної – $9,5 \pm 0,6$ см; кільки чорноморської – $6,7 \pm 0,4$ см. Встановлено найменший вміст натрію хлориду було виявлено у «Тюльці спеціального посолу» – 4,6 % (за норми згідно з ДСТУ 19588:2009 – 6–8 %). Масова частка складових у пресервах риби/заливки децю порушена. Так, у «Тюльці спеціального посолу» – 8,9 % складає заливка (за норми не менше 10 %); у «Мойві жирній спеціального посолу» – 6,7 % складає заливка (за норми не менше 7 %). Особливо важливий показник у пресервах із риби спеціального посолу консервант – натрію бензоат був у межах норми згідно з ДСТУ 19588:2009 – не більше 0,1 %. Найменший вміст КМАФАНМ було виявлено у пресервах «Тюлька спеціального посолу» – $(3,21 \cdot 10^2) \pm 52,6$ КУО/г, «Мойва далекосхідна спеціального посолу» – $(3,86 \cdot 10^2) \pm 28,9$ та «Хамса спеціального посолу» – $(4,43 \cdot 10^2) \pm 29,6$ КУО/г. У продукції інших видів пресервів вміст МАФАНМ був децю збільшеним, особливо у «Салаці спеціального посолу» – $(7,66 \cdot 10^2) \pm 30,1$ КУО/г та «Оселедець «Матъє» філе у маринаді» – $(7,52 \cdot 10^2) \pm 28,8$ КУО/г. Вміст токсичних елементів у досліджуваних пресервах із риби спеціального посолу був у межах допустимих рівнів згідно з ДСТУ 19588:2009, а радіонуклідів ^{137}Cs та ^{90}Sr – не перевищував допустимих рівнів, установлених ГН 6.6.1.1-130–2006.

Ключові слова: ризик-орієнтований контроль, пресерви, риба-сирець, спеціальний посол, якість, безпечність.

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