

MODERN EXPERIENCE OF THE USE OF IODINATED SALT IN THE PRODUCTION OF CANNED VEGETABLES

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Abstract: In this work the results of researches on the utilization of the iodated salt at the production in industrial conditions of the tinned food „Red natural beans”, „Whine natural beans”, „Canned green peas”, „Canned sweet corn”, „Pickled cucumbers”, „Salted tomatoes” and „Salted cucumbers” are presented. There have been settled the indices of their quality (exterior factors, physico-chemical factors, microbiological factors, factors of safety) in comparison with the control samples of the same production that was made using the common salt. The obtained results are to be used in the decision taking on the general use of the iodated salt in the canned goods industry of the Republic of Moldova.

Key words: iodine salt, tinned food, industrial production

Introduction

Water and soil in the Republic of Moldova are known for their low iodine content. The low content of iodine in foodstuffs is not sufficient for covering the people's need for iodine. The country's population, as a rule, consumes foodstuffs produced on their individual farms or foodstuffs produced from local raw materials containing insufficient quantities of iodine. Given all above mentioned, it is urgently required to enrich the foodstuffs with iodine in order to reduce the iodine deficiency and the incidence of diseases caused by it. The Government of the Republic of Moldova has initiated a series of activities aimed to liquidate the iodine deficiency. In the year 2011 was adopted the second National Program of Iodine Deficiency Liquidation until the year 2015 [1].

Regardless of the fact that in many countries (Switzerland, Germany, Poland, Hungary, Slovakia, Denmark and others.) the cooking salt is subject to compulsory iodination [2, 3, 4], the specialists of production enterprises and the consumers of the Republic of Moldova are critical to the use of iodinated salt for the production of foodstuffs and namely canned foodstuffs due to the fact that iodine may alter the color of canned vegetables, soak the tissues of vegetables in the pickled or salted finite products, especially tomatoes, cucumbers, cabbage, paprika, gourds and others.

In order to obtain the necessary arguments to recommend the enterprises of canning industry and the consumers to use iodinated salt, the Scientific-Practical Institute of Horticulture and Food Technologies of the Republic of Moldova has conducted tests of canned products within the shelf life periods provided for in the applicable standards.

The aim of this research is determination of the possibility of using iodinated salt for the production of canned vegetables by the enterprises of the Republic of Moldova.

Canned vegetables (canned sweet corn, natural red beans, natural white beans, canned green peas, marinated cucumbers, salted cucumbers, salted tomatoes) produced with the use of iodinated salt – experimental lots. Products produced in accordance with the prevailing normative documents were used as reference samples.

There were selected the following places for the research activities: Practical Scientific Institute of Horticulture and Food Technologies of the Republic of Moldova;

enterprises of the food canning industry of the Republic of Moldova (S.A. „Cosnita Canning Factory”; S.A. „Alfa-Nistru” Soroca; F.C. „Merencon” Mereni village, LLC „Gutarom” Budesti village, S.A. „Natur-Bravo” Cupcini village); Center of Standardization and Determination of Quality of Canned Foodstuffs.

Methods and materials

The activities in the view of determining the possibility of using iodinated salt in the production of canned vegetables included: analysis of the assortment of canned vegetables produced in the Republic of Moldova with use of salt; determination and selection of the most vulnerable (from the producers' point of view) assortment of canned foods; production of canned vegetables in industrial conditions with use of iodinated salt – experimental samples and reference samples based on traditional methodology; determination of criteria and quality characteristics of canned foods to be analyzed during the production and storage; determination of the periodicity of quality assessments.

The storage of canned products was arranged for by and at the respective producers at the prescribed temperature and relative humidity of air.

Physical-chemical, microbiological and organoleptic properties considered upon the determination of quality of the canned vegetables.

The research described above was performed in accordance with the standardized norms and methodologies accepted in the scientific practice. In accordance with the respective standards were determined the external appearance of packaging, the tightness of packaging and metallic cans, net weight, mass fractions; pH, optical density of covering liquid at $\lambda = 540$ nm, mass fractions of cooking salt, titrable acids, mineral and vegetal impurities, iodine content in the cooking salt and in the finite product, dry soluble substances, foreign bodies, mercury, arsenic, copper, cadmium, zinc, lead and tin. Besides all these, microbiological analyses have been performed to determine the number of germs from the group of intestinal Coliforms (E Coli count).

The basic criterion for the determination of the possibility of using iodinated salt for the production of canned foods in the case of conformity with all the standardized characteristics has been the organoleptical one: external appearance, taste, smell, consistence measured by a system of 5 points - all these were determined during the open sessions of the Institute's Tasting Commission with the participation of interested organizations (representatives of producers, of the Ministry of Health, of the Ministry of Agriculture and Food Industry, of the Service for Standardization and Metrology, of the National Institute for Standardization and Metrology, as well as of the Ministry of Economy and Commerce, UNICEF, mass-media, etc.).

Results

Both the tested and the reference samples were produced of the same raw materials, following the same technological scheme, with observation of all requirements to the preparation and processing of raw materials, sterilization and storage. The content of salt and other ingredients was identical both in the experimental and the reference samples.

The mass fraction of iodine in the iodinated salt used for the production of canned vegetables „Sweet corn” was 32,0 mg/kg; „Red natural beans” – 34,4 mg/kg; „White natural beans” – 32,8 mg/kg; „Salted tomatoes” – 31,7 mg/kg; „Canned green peas” - 35,7 mg/kg; „Picked cucumbers” – 37,0 mg/kg; „Salted cucumbers” – 31,2 mg/kg.

The analysis of quality characteristics was performed at the canning factory and after one year from the date of production, on quarterly basis (for salted products – after six months of storage).

The comparative analysis of physical-chemical standardized properties of the experimental and reference samples, including the safety aspects of the cans investigated during their normal shelf life has demonstrated full compliance with the provisions of normative documentation. The optical density of the solutions covering the top of the can contents diluted to 20 times is approximately at the same level both for the experimental and reference samples.

The results of organoleptic evaluation obtained by tasting of samples of canned products during their storage period are set out in the Table 2.

The results of organoleptic evaluation confirm the absence of any differences between the samples produced with iodinated salt and usual salt.

The members of the tasting commission and the invitees have mentioned that the use of iodinated salt did not affect the organoleptic properties of the products and were unable to detect that iodinated salt was used for the production of any particular product.

The iodine preservation rates in the canned products were measured during the entire storage period of the considered products. The results set out in the Table 3 imply that around 44-58% of the initial quantity of iodine is preserved in the products.

Conclusions

The preliminary results have demonstrated that pursuant to the analyses of physical-chemical and microbiological characteristics, as well as based on the results of safety tests conducted during the storage period no noticeable difference has been established between the products prepared with iodinated salt and the ones prepared with usual salt.

The analysis of organoleptic characteristics has demonstrated that the iodinated salt doesn't affect the consistence, the color, taste and smell of the considered canned products during storage.

The research of the quality of experimental and reference samples will be continued for the entire unexpired guaranteed shelf life of the considered products.

Table 1. Some physical-chemical characteristics of cans

Parameters	Normal value as set out in normative documents	Values			
		Initial lot value		After storage during one year	
		experimenta 1	control	experimenta 1	control
1	2	3	4	5	6
„Canned sweet corn”, S.A. „Canning Factory of Cosnita” (in metallic cans of 425 ml)					
Mass fraction of iodine, mg/kg	no standard value	0,58	0,13	0,30	-
Mass fraction of corn in the net weight, %	min. 60	82	83	81	84
Mass fraction of sodium chloride, %	0,8-1,5	1,5	1,4	1,5	1,4
Titrateable acidity, %	no standard value	0,10	0,10	0,12	0,15
1	2	3	4	5	6
Optical density of covering solution at $\lambda = 540$ nm	no standard value	0,083	0,075	0,077	0,075
„Whine natural beans”, S.A. „Alfa-Nistru” Soroca (in metallic cans of 425 ml)					
Mass fraction of iodine, mg/kg	no standard value	0,52	0,17	0,47	-
Mass fraction of beans in the net weight, %	min. 50	56	56	55	53
Mass fraction of sodium chloride, %	1,0-1,8	1,3	1,3	1,3	1,3
Titrateable acidity, %	no standard value	0,10	0,10	0,08	0,07
Optical density of covering solution at $\lambda = 540$ nm	no standard value	0,313	0,310	0,310	0,310
„Canned green peas”, S.A. „Canning Factory of Cosnita” (in glass pots of 720 ml)					
Mass fraction of iodine, mg/kg	no standard value	0,66	0,32	-	-
Mass fraction of peas in the net weight, %	min. 65	60	59	60	59
Mass fraction of sodium chloride, %	0,8-1,5	1,2	1,4	1,2	1,4
Optical density of covering solution at $\lambda = 540$ nm	no standard value	0,047	0,051	0,047	0,051
„Pickled cucumbers”, S.A. „Natur-Bravo” Cupcini in glass pots of 720 ml)					
Mass fraction of iodine, mg/kg	no standard value	0,73	0,25	0,47	-
Mass fraction of vegetables in the net weight, %	min. 50	51	51	51	51
Mass fraction of sodium chloride, %	1,5-2,0	2,0	1,8	2,0	1,8
Titrateable acidity, %	0,5-0,7	0,6	0,5	0,6	0,5
Optical density of covering solution at $\lambda = 540$ nm	no standard value	0,009	0,008	0,009	0,008
„Salted cucumbers”, LLC „Gutarom” Budesti (in plastic barrels of 70 kg)					

Mass fraction of iodine, mg/kg	no standard value	1,54	0,32	0,65	-
Mass fraction of cucumbers in the net weight, %	min. 50	81	80	84	75
Mass fraction of sodium chloride, %	2,5-3,5	2,5	2,6	2,5	2,6
Titrate acidity, %	0,6-1,2	0,5	0,5	0,6	0,6
Optical density of covering solution at $\lambda = 540$ nm	no standard value	0,055	0,055	0,060	0,060

Table 2. General organoleptic evaluation of samples of canned products

No.	Samples	General tasting mark	
		experimental	Reference
1	Canned Sween corn	4,7	4,7
2	Red natural beans	4,7	4,8
3	White natural beans	4,8	4,8
4	Salted tomatoes	4,6	4,6
5	Green peas in metallic cans	4,9	4,8
6	Green peas in glass pots	4,8	4,8
7	Pickled cucumbers	4,9	4,9
8	Slated cucumbers	4,9	4,6

Table 3. Integration of iodine in the industry samples of canning products at the end of term of guaranteed storage

No.	Products	Storage period, months	Mass fraction of iodine, µg /100g of product	Preservation of iodine, %
1	Sweet corn	19	34	58
2	Red natural beans	19	28	54
3	White natural beans	14	27	52
4	Pickled cucumbers	10	42	58
5	Salted cucumbers	10	42	44
6	Salted tomatoes	10	62	44

Reference

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