

## PRODUCTION OF DRY-CURED MEAT PRODUCTS USING THE STARTER CULTURES OF NEW GENERATION

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Dry-cured meat products are valuable foods, and what is especially important, they are suitable for consumption of the people for whom smoked foods are counterindicated.

Besides, they are ecologically more safe because smoking is not used in their production; they are nutritious, have valuable biological properties, can be stored for long periods of time. Therefore increase in their production volume is an urgent problem.

Much progress in the increase of production of dry-cured meat products is achieved through the purposeful use of biologically active substances of microbial origin.

The All-Russian Meat Research Institute has developed an effective bacterial preparation (starter culture) of new generation based on lactic acid bacteria and denitrification Micrococcaceae bacteria for use in meat industry. Its technology has been patented.

Toxicological and hygiene investigations indicated low acute and chronic toxicity of the preparation with intrastomach supply and the absence of pronounced general toxic effect.

1 g of the preparation – a uniform cream-coloured, odourless powder – contains 20-30 and 10-20 blns, of viable lactic bacteria and Micrococcaceae respectively. Guaranteed shelf life of the preparation is 6 months. It is rather easily used: rehydration in boiled water and adding into the comminuted meat during cutting the raw materials.

The preparation has a high acid formation capability and produces a large number of carbonyl and four-carbon compounds which makes it possible to create a pronounced flavour and aroma of meat products. It is capable to inhibit sanitary-indicative microflora during fermentation of the product. The presence of denitrification organisms in the product helps to form a necessary quantity of nitrosopigments, i.e., obtaining of a more stable colour of meat products.

### PURPOSE OF INVESTIGATIONS

Creation of the bases of intensive technology of dry-cured sausages using a bacterial preparation of new generation.

### OBJECT AND METHODS OF INVESTIGATIONS

Dry-cured sausages as produced with the use of a new bacterial preparation, beef of prime category (1<sup>st</sup> version) and beef of 1<sup>st</sup> category (2<sup>nd</sup> version), and back fat also. In composing the batter, during cutting of beef, back fat and curing ingredients (common salt, sodium nitrite, black pepper and piment) a rehydrated bacterial preparation at 200 ml per 100 kg of raw materials was introduced. Then the casings were filled, and heat treated: dried, sub-pressed and further dried in a room at 12 °C and relative humidity 75-80% up to the standard values of moisture and meeting the criteria of safety. The sausages can be manufactured using different formulations (1 and 2 versions). The sausages can have traditional round shape (A) or after pressing – ellipsoidal (B). During the investigations the following methods were used: determination of the content of mass fraction of moisture, fat, ash, proteins, salt, sodium nitrite, pH – according to standard technique; the content of titratable acidity – by titration; lactic acid – by the method of Frideman; volatile fatty acids – by the method of steam distillation; sum of carbonyl compounds – by bisulphite method; microbiological and microstructural investigations – by standard technique.

### RESULTS AND DISCUSSION

Results of physico-chemical and biochemical investigations are presented in the Table.

Characteristics	Step of investigations*	Version 1		Version 2	
		A	B	A	B
Physical and chemical:					
pH value	1	5.74	5.74	5.68	5.68
	2	5.74	5.30	5.74	5.17
Content, %:					
moisture	3	5.11	5.02	5.16	5.04
	2	47.80	43.70	45.20	41.40
	3	32.08	30.91	32.38	29.81
fat	3	46.50	43.48	46.87	44.02
protein	3	16.80	21.10	16.50	21.70
ash	3	4.60	4.49	4.26	4.44
common salt	3	2.79	2.92	2.83	3.00
sodium nitrite	3	0.00033	0.00026	0.00030	0.00022
Biochemical, mg%:					
titratable acidity	3	321.63	462.06	305.78	348.81
volatile fatty acids**	3	38.28	60.80	26.68	54.11
lactic acid	3	864.87	906.76	815.28	850.43
sum of carbonyl compounds	3	1.089	1.298	0.968	1.254

\*Step of investigation: 1 – prior to stuffing; 2 – prior to heat treatment; 3 – finished product;

\*\*calculated for propionic acid;

\*\*\*calculated for acetylaldehyde



It was found that pH of the initial batter had similar values irrespective of formulation. However, different conditions of settling accelerated the process of sausages fermentation, subjected to pressing. Thus, pH value, mass fraction of moisture and fat in sausages subjected to pressing, had a lower value, than in round sausages, and protein content in them was higher by 4.7%. As pH value decreased, the content of common salt increased, as well as the amount of lactic acid, free titrable and volatile fatty acids, and the sum of carbonyl compounds.

During fermentation all the samples exhibited a gradual increase of lactic acid, that was accumulated as a result of decomposition of meat glycogen and fermentation of sugars by microorganisms contained in the raw materials and introduced with the bacterial preparation. Hence, unfavourable conditions for the development of undesirable microflora are created.

In the finished products the content of mesophilic aerobes and facultative anaerobes decreased by several orders as compared to the initial batter, and coliform bacteria were completely absent in 0.1 g of the product at 16-19 days of drying. No bacteria of *Salmonella* species were found in 25 g, sulfite-reducing clostridia in 0.1 g, *S. aureus* in 1 g, neither in the raw materials, nor in the ready product. The content of lactobacillas and Micrococcaceae varied in the ranges  $10^2$ – $10^3$  cfu/g.

Organoleptical evaluations of the finished products indicated that all the samples of sausages had a dense texture, bright colour, pleasant flavour and aroma that was characteristic of those types of products. Higher scores were marked for the sausages subjected to pressing, that was confirmed by biochemical data.

Microstructural investigations have shown that microorganisms of a new bacterial preparation accelerate fermentation of muscular proteins, and thus influence significantly the formation of the structure of the ready product.

It features good interconnection and compactness of the arrangement of the main structural elements of the meat, low porosity – on the average up to 10.2% that depends on the presence of shallow microvoids (up to 250-300  $\mu$ m), penetrating fine grained proteinaceous mass, absence of slot-like spaces that points out to strengthening of links between protein particles. In this case a well-pronounced homogenization and linkage of muscular fibers are observed, as well as multiple decomposition of fibrillar contractile proteins to a grainy mass, decomposition of sarcolemma and lysis of nuclei. Destructive changes of connective tissue are revealed and presented as the homogenization of a fiber component and a lysis of nuclear elements. No significant changes were observed in the structure of elastic elements.

The above-mentioned alterations eventually contribute to the formation of the uniform monolithic and well-connected structure of the product and positively influence their organoleptical characteristics.

## CONCLUSION

A correlation relationship between moisture content, common salt and fat; pH value, amount of lactic acid, titratable acidity, characterizing the process of sausage ripening was established. The revealed amount of volatile fatty (up to 55-60 mg%) and free titratable (up to 460 mg%) acids, carbonyl compounds (up to 1.3 mg%) and lactic acid (up to 900 mg%) in the products determined high organoleptical characteristics of ready products.

Dry-cured sausages as manufactured with the use of a new bacterial preparation possess the properties (flavour, aroma, colour, consistency, etc.), meeting the demands of the Russian consumer. Duration of their drying is 16-19 days depending upon technological procedures; the yield of the ready product is 69-71%. The technology provides for the production of the foods meeting the criteria of safety in relation to the health of consumers, accepted in international practice.

## REFERENCES

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