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# Expediency of creation of technology of production of meat products of long term of storage of the combined structure

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**Abstract.** The technological properties of seaweed and activated water are studied in the article and various recipes of canned meat with the use of animal raw materials, elamine and catholyte are analyzed. The results of research of functional and technological properties, chemical composition, nutritional and nutritional value, organoleptic evaluation of the finished product are obtained. An improved technological scheme of production has been developed.

## 1. Introduction

Proper nutrition is extremely important for the accumulation of immune system reserves to fight infection. Limited availability of fresh food can reduce opportunities for healthy and varied food. In addition, the result of such a restriction may be an increase in the consumption of processed products and characterized by high fat, sugar and salt.

The global trend in the field of food technology is the development of innovative foods of high nutritional value, which are able to influence various physiological processes in the human body, as well as stimulate and improve resistance to various diseases [1]. To achieve this effect, it is necessary to introduce into the composition of food functional ingredients with certain physiological properties.

Solving the problems of food nutrition is inextricably linked with the meat industry, namely with increasing production and expanding the range of high quality, competitive, safe products with long shelf life and high protein content [2].

Given the current economic problems, new approaches in the field of meat technology and healthy human nutrition, it is extremely important to develop new technologies for high quality meat products, which rationally use regional meat and vegetable raw materials, existing production areas and equipment, for due to which the finished product has a low cost [3-4].

In this regard, a promising area is the creation of long-term meat products - canned food, as a multi-component system, with a given chemical composition and functional properties, etc.

## 2. Methodology

During the research all experimental studies were conducted in research laboratories of the Department of Technology of Meat, Fish and Seafood of the National University of Life and Environmental Sciences of Ukraine, Food Resources Institute of NAAS of Ukraine, Palladin Institute of Biochemistry of the National Academy of Sciences of Ukraine.

At the first stage of the work the scientific literature on the state of nutrition in the modern world, the problem of rational nutrition, the potential use of animal and plant raw materials in the complex,



its impact on the human body was studied. The analysis of this information allowed to determine the object and subject of research, as well as to choose research methods.

During the next stage, the technological properties of seaweed and activated water were determined.

The next stage was the study of various recipes for canned meat using animal raw materials, elamine and catholyte.

After improving the recipe of canned food, a number of studies were conducted, namely:

- Determination of functional and technological properties of the finished product;
- Determination of the chemical composition of canned food;
- Determining the nutritional and nutritional value of the product;
- Conducting organoleptic evaluation of canned food according to an improved recipe.

After the research, an improved technological scheme of production was developed.

Based on many years of research, NULES of Ukraine specialists have proved the relevance of integrated use of protein-containing plant and animal raw materials and the prospects of food products of combined composition, as well as developed various new technologies for the production of meat products.

### 3. Results

Recently, the deterioration of human health is due to unfavorable environmental conditions caused by pollution of the earth's atmosphere and water resources, unbalanced diet, deterioration of radiation in large parts of Ukraine, Belarus, Russia, due to the Chernobyl accident [5]. The unfavorable environmental situation after the accident at the Chernobyl nuclear power plant was a decisive impetus for the search for new food components and one of the areas is to study the possibilities of using seaweed. Algae, especially brown, contain large amounts of iodine salts. Many researchers have shown that kelp has the ability to accumulate minerals and such important components as potassium and iodine in elephants more than in other algae [6-7].

Given the unique properties of brown seaweed, including kelp, specialists of PJSC "Lactic Acid Plant" together with scientists of the Research Institute of Nutrition of Ukraine and the Scientific Center of Radiation Medicine of the Academy of Medical Sciences of Ukraine developed an original technology for dietary supplement elaminum from brown seaweed.

The use of elamin in food satisfies the body's need for iodine, has a positive effect on the normalization of the central nervous system; improves protein assimilation, improves the absorption of phosphorus, calcium, iron, activates a number of enzymes, improves metabolic processes; normalizes the activity of the cardiovascular and respiratory systems; strengthens the immune system and more [8-9].

Elamine is a powder, there are various ways to introduce it into the meat system, in particular, hydrated and dry. During the research, hydration was performed with pipeline water  $t = 40$  °C in the ratio of elamin:water 1:10. Based on the obtained research results, the dependence of iodine losses on the temperature and type of system was revealed. When dry elamin is heated to the temperature of canned meat production, the iodine content in the test sample decreases by 21.7% relative to the initial value.

Heating the hydrated preparation to 120 °C results in the loss of the largest amount of iodine - 38.1%, which is probably due to the dissolution in water of iodine not bound to the protein components of elamin, which goes into the free state and evaporates.

The smallest losses of the studied microelement were observed during heat treatment of meat systems, in which dry and hydrated elamine was added.

The pH of the sample decreases from the initial value of 8.46 to 8.01 during storage. However, a pH of 8.01 is acceptable for the process mixture, as it will affect the meat system similar to phosphates.

During the analysis of the functionally stabilizing composition, it was decided to use activated water - catholyte, as catholyte increases the solution's ability and has the biological activity of a growth stimulator and vital activity of living organisms and plants. Samples from the city water supply network were taken for research in the laboratory of the Department of Meat, Fish and Seafood of NULES of Ukraine.

In order to determine in more detail the interaction of activated water and the functional drug "Elamine", a study of the hydrated system "Elamine-Catholyte" was conducted. Hydration of 1:2 experimental and control samples was performed.

The pH of the test sample decreases from the initial value of 9.73 to 9.20 during storage, which indicates changes in the activated system. However, the pH at 9.2 is acceptable for the process mixture, as it will have a phosphate-like effect on the meat system.

The research results prove the positive effect of the activated aqueous medium on the physicochemical and functional-technological properties of the developed stabilizing composition, which was used for further research. For further research, test batches of canned pieces according to GOST 608-93 "Poultry in jelly" were made. Product formulations are presented in table 1.

**Table 1. Formulation of control and experimental samples of canned food, %.**

Component	Samples			
	Control	Experiment № 1	Experiment № 2	Experiment № 3
Chicken meat	91.37	-	-	-
Turkey meat	-	91.37	91.37	91.37
Food salt	0.9	0.9	0.9	0.9
Edible gelatin	1.14	1.14	1.14	1.14
Water	6.59	-	-	-
Water - catholyte	-	6.09	5.59	5.09
The drug "Elamine"	-	0.5	1	1.5

Based on the obtained research results, the expediency of using a small concentration of iodine in the amount of 0.5% was identified, so for further research, an experimental sample № 1 was selected.

The obtained data of chemical composition in heat-treated products indicate that the control and experimental sample of canned food meet the requirements of GOST 608-93 "Poultry in jelly", ie the samples can be considered high quality. In the experimental sample, the protein content increased by 7.72%, decreased fat content by 30.4%, the mass fraction of moisture is 64%, which is 4.91% higher than in the control. The increase in moisture content can be explained by the fact that activated water is more strongly bound to protein molecules and functional ingredients.

The energy value of the test sample was reduced by 15.1% from the control sample. The test sample can be used in the diet as a low-calorie product.

Physicochemical properties were determined in ready-made canned food. The difference in the change in the moisture-binding capacity of canned food can be explained by the interaction of meat proteins with alginate, as a result of which a complex gel is formed, which causes the presence of additional forces to retain activated water.

The increase in fat-holding capacity of canned food with the drug is explained by the fact that the main components of animal fats are triglycerides, which are characterized by the presence of nonpolar hydrocarbon compounds in their structure, which are insoluble in water and unable to form stable dispersion systems. Based on the results of the study of the mineral composition, it can be concluded that the experimental sample is characterized by an increased content of micro- and macroelements, the iodine content satisfies the daily requirement of consumption of this element by 43.6%. Such a share of mineral substances allows to include the prototype in the group of functional products [120].

The rate of protein digestion was determined by the method, which consists in the sequential effect on the protein substances of the studied object by a system of proteinases consisting of pepsin and

trypsin. Digestibility of proteins "in vitro" of control and experimental samples of canned food is presented in table 2.

**Table 2.** Digestibility of in vitro proteins of control and experimental samples of canned food.

Enzyme	Digestibility, mg tyrosine / g protein	
	Control	Experiment
Pepsin	13.76 ± 0.06	14.12 ± 0.06
Trypsin	14.48 ± 0.07	15.02 ± 0.07
General digestibility	27.34 ± 0.13	28.34 ± 0.13

According to table 2, in the control sample, the total digestibility is 27.24 mg of tyrosine / g of protein, in the experimental sample - 28.14 mg of tyrosine / g of protein, which is 1 mg of tyrosine / g of protein more than the control sample. This indicates a positive effect of the drug "Elamine" and the activated environment on digestion.

In the process of preservation, the experimental sample keeps the pH value at a level that corresponds to the meat product of high quality, while in the control there is a shift of the pH value to alkaline.

Changes in the quality and nutritional value of products are associated, first of all, with oxidative damage to lipids, which develops and is activated with the participation of free radicals, which leads to the accumulation of hydroperoxides in the product and their subsequent decomposition to form a second, low molecular weight acids, etc.

Analysis of the research results proves that the test samples are more resistant to oxidation processes. This indicates the stability of the lipid fraction of the product, which determines the shelf life of food.

Based on this, we can conclude that activated water, due to its low redox potential and the accumulation of OH ions, is able to neutralize the action of free radicals, which are unstable molecules. Due to the high antioxidant activity, the catholyte acts as an electron donor, thereby neutralizing the action of free radicals on the system [9]. The level of water activity affects the intensity of lipid oxidation, the activity of enzymatic, microbiological and other processes. The water activity index can be used to predict the microbiological and enzymatic stability of food products during storage.

Analyzing the results, it is seen that during storage the control sample had a higher water activity compared to the experimental one, which confirms the resistance of canned food to the activity of the microflora and antioxidant properties of activated water.

Studies of the microbiological safety of canned meat have shown that the replacement of pipeline water by the alkaline fraction of activated water reduces the development of unwanted microflora.

The results of organoleptic evaluation of canned meat of the control and experimental samples confirmed the good quality characteristics of canned food.

#### 4. Discussion

The Ukrainian market of functional products is mainly represented by pharmacological drugs, imported food additives and soy products. In this regard, a promising area is the creation of products with functional properties based on meat for different groups of the population, taking into account the specifics of metabolic processes, in particular, for people with high physical activity due to the peculiarities of professional activity [8-9].

Nutritional adequacy is becoming increasingly important, as people with reduced immunity are more vulnerable to various diseases. In addition, a direct link between nutritional adequacy and a positive result in the rate of recovery and reduction in mortality of critically ill patients with the incidence of COVID-19 has already been confirmed. The relationship between protein intake and the ease of the disease and the reduction of the time spent in a critical condition.

Currently, there is a shortage of animal proteins, vitamins, macro-and micronutrients in the diet, so it is necessary to develop products enriched with missing components. Consumption products that are available to all groups of the population and used in everyday food, such as canned food, should be enriched.

One of the stages of scientific work was the study of the radioprotective drug "Elamin" and the effectiveness of its use in the technology of canned meat.

The iodine-containing preparation Elamine is well suited for the development of a functionally stabilizing composition, because, in addition to a balanced complex of micro- and macroelements and specifically biological components, it contains alginate, which is a structure-forming agent.

During the analysis of the functionally stabilizing composition, it was decided to use activated water - catholyte, as catholyte increases the solution's ability and has the biological activity of a growth stimulator and vital activity of living organisms and plants.

Experimental studies have shown that the use of the alginate-containing drug Elamine and activated water improves the structural and mechanical properties, physicochemical and qualitative parameters of the finished product. The obtained data were the basis for improving the technology of canned meat. A distinctive feature of this technology is the additional introduction of the functional drug "Elamine" and the replacement of tap water with activated fraction (catholyte) in quantities that meet the needs of the technological process of production. The technology allows to obtain a product with high content of dietary fiber, high quality, biological and nutritional value.

The technological process of canned meat production consists of preparation of raw materials, division into parts, packing, packaging, labeling and storage.

Activated water-catholyte is prepared with the help of special equipment (AP-1 activator).

Elamine is hydrated in water in a ratio of 1:2 to the weight of the raw material for 30 minutes, so that during mixing the components are evenly distributed throughout the volume of meat, the mixture binds to the structure of muscle tissue. Gelatin is pre-soaked in baths with water, the temperature of which is not more than 20°C.

Packing takes place according to GOST 5981, rolling, sterilization of canned food is carried out at a temperature of 100°C and above.

Thus, the developed advanced technology for the production of canned meat using alginates and activated aqueous media allows to obtain a high-quality product in the form of canned food for functional purposes "Turkey meat in jelly".

## 5. Conclusion

The results of monitoring the data on the use of various food additives in the production of canned meat showed promising opportunities for the use of iodine-containing preparation of elamin in the production of functional meat products.

Theoretically substantiated and experimentally confirmed physicochemical and radioprotective properties of the functional drug elamine. It is established that the introduction of elamin in the amount of 0.5%, which contains alginate, in the minced meat allows to optimize the structural and mechanical characteristics of the minced meat, improves the consistency of canned meat and plasticity; The product is characterized by a high content of dietary fiber, minerals, high quality, biological and nutritional value, antioxidant and radioprotective properties.

On the basis of the obtained data, the perfected technology of production of canned meat with the use of biologically active additives ("Elamine"), raw meat (chicken, turkey, duck) was developed. The proposed method allows to obtain a high quality product with a functional focus with increased biological and energy value.

Technologies for the production of dietary combined meat and vegetable products with radioprotective properties of long shelf life have been developed and a range of dietary preserves has been created: "Rice porridge with chicken meat and elamin", "Turkey meat in jelly".

Formulations of functional foods should be developed on the basis of the modern concept of a balanced and adequate diet [10].

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