APPLICATION OF COMBINED PROTEIN PREPARATIONS IN DIETARY MEAT PRODUCTS

KOSTADIN WASSILEV, MARIA POPIVANOVA, STEFAN DANCHEV and STEFAN DRAGOEV

Higher Institute of Food and Flavour Technologies,
26 Lenin Blvd., Plovdiv 4002, Bulgaria.

SUMMARY: Recently there has been a growing interest in combined protein preparations based on animal and vegetable proteins which possess suitable functional properties and more favourable chemical compositions from the point of the contemporary requirements of nutrition physiology for people suffering from certain diseases.

The present work experimented the addition of a combined protein preparation (based on gluten and dry defatted milk) in amounts of 2, 3, 4 or 5% in cooked non-durable sausages designed as dietary food for people suffering from obesity. The study covered the influence of the preparation on the functional properties (water-holding capacity and meat emulsion stability) of the stuffing mass as well as on the basic chemical composition of the finished product. Mathematical methods were used to optimize the finished product composition with regard to specific medico-biological requirements. The clinical tests indicated that that type of sausage could be used by patients with obesity.

INTRODUCTION: The manufacture of dietary meat products for certain diseases is a problem of social importance.

Meat products that satisfy the requirements of dietary nutrition are easier to formulate when using a combination of meat and protein preparations of non-meat origin (Brazhnikov A.M. et al., 1984; Brizgin et al., 1977).

There is a growing interest in the formulations based on animal and vegetable proteins (Martines D. et al., 1985; Pellet P.L. et al., 1980).

In order to obtain the desired correspondence between the finished product composition and the medico-biological requirements of the specific disease, mathematical methods are now being used by a number of authors (Voyakin M.P. et al., 1981; Stigler G.I., 1945; Salavatulina R.M. et al., 1985; Gazanov G.I. et al., 1983; Lazarev V.L. et al., 1985; Gaddis A.M. et al., 1950).

The aim of the present work was to experiment the addition of a combined protein preparation (based on dry wheat gluten and dry defatted milk) in cooked non-durable sausages that will be used in dietary nutrition of persons who suffer from obesity, and also to determine the influence of the preparation on the functional properties of the stuffing mass and the chemical composition of the finished product.

MATERIALS AND METHODS: The experiment was carried out with a cooked non-durable sausage variety used as dietary food in cases of obesity. The main meat raw materials were veal and non-fat pork, and semifat pork with 35% fat. The non-meat materials were dry wheat gluten and dry defatted milk.

The meat was first cooled and then cut into 50-100 g pieces that were treated with 1.5% salt, and were then left to age at 0°to 4°C for 48-72 hours. The use of aged meat was induced by the absence of phosphates and by the low sodium chloride content (1,5%).

The dietary sausage formulation was worked out by linear programming. For that purpose, on the basis of the general physico-chemical composition of meat and the requirements for dietary nutrition, it was developed a mathematical model of the general physico-chemical composition of the stuffing mass. The stuffing for each sample variant was tested for its water-holding capacity characterized by the amount of free and bound water measured by Grau and Hamm's method and modified by Volovinskaya.

The finished product was analyzed for its general chemical composition: water content, proteins and fats. The water content was measured by drying the samples at 105°C to a stable weight; proteins were measured by Kjeldahl's method, fats by Soxlett's method.

The all-meat sausage sample was used as a control. The test samples were prepared by adding, prior to their cutting, 2, 3, 4 or 5% of gluten and defatted milk that were previously hydrated.

The finished product was organoleptically evaluated according to a 9-grade scale in order to establish the effect of the protein preparation from the point of view of the consumer

RESULTS AND DISCUSSION: In view of the basic physico-chemical composition of meat (I grade veal, non-fat pork and semifat pork), on one hand, and the requirements of dietary nutrition in cases of obesity, and the technological limitations, on the other, we made up by linear programming the following mathematical model whose target function was maximum protein content and minimum fat content: veal - 50%; non-fat pork - 37.5%; semifat pork - 12.5%.

Having specified the meat composition of the dietary sausage we prepared 4 sample variants by adding the above mentioned amounts of dry wheat gluten and dry defatted milk.

Table 1. Formulations of the sausage variants.

Material		I	II	III	IV	V
		Control	Test Samples			
I-grade veal,	%	50.0	50.0	50.0	50.0	50.0
Non-fat pork,	%	37.5	37.5	37.5	37.5	37.5
Semifat pork,	%	12.5	12.5	12.5	12.5	12.5
Gluten,	%	-	2.0	3.0	4.0	5.0
Milk,	%	-	2.0	3.0	4.0	5.0
Salt,	%	1.5	1.5	1.5	1.5	1.5

The water added to the meat samples was 25%, and 200% was used for the preliminary hydration of the dry milk and dry gluten.

The results about the effect of the combined protein additive on the water-holding capacity of the stuffing mass are given in Table 2.

Table 2. Water-holding capacity of the stuffing mass at various levels of protein preparation.

Factor	Sample Type				
	I	II	III	IV	V
Free water, %	21.31	21.27	18.34	17.15	16.68
Bound water, %	49.86	49.15	52.09	52.18	53.22
Bound water in % to total water	70.27	69.60	74.42	75.46	76.14

The results in the above table show that the water-holding capacity of the stuffing increases with higher levels of protein regardless the fact that the preparation itself has been hydrated in advance. When introduced in dry condition that effect would be undoubtedly much stronger. The liberated free water values gradually decrease from control sample (I) to variant V test sample.

Table 3 contains the results for the general chemical composition of the tested samples. They indicate, from the point of their chemical compositions, that the samples satisfy the necessary requirements of dietary nutrition .

The protein content is high while the fat content is low, therefore, these sausages are low-energy food. When increasing the amount of the protein addition the sample responds more fully to the specific medico-biological requirements for chemical composition. However, there are certain technological limitations to be considered that contribute to the good quality of the finished product.

Table 3. Chemical composition of the finished product.

Characteristic	Sample Type				
	I	II	III	IV	V
Water content, % of total mass	70.96	70.63	70.01	69.15	69.90
Protein content, % of total mass	17.32	18.53	19.78	20.65	21.42
Protein content, in % of dry matter	59.64	63.09	65.96	66.94	71.16
Fats content, % of total mass	8.70	7.95	7.28	7.13	5.58
Fats content, % of dry matter	29.96	27.07	24.27	23.11	18.54
Proteins:Fats Ratio	1.99	2.33	2.72	2.90	3.84

In this relation, the four sample variants were organoleptically evaluated (see Table 4).

Table 4. Organoleptical evaluation.

Characteristic	Sample Type				
	I	II	III	IV	V
Outer appearance	9	9	9	9	9
Cutting surface colour	9	9	8	7	6
Flavour	9	9	9	7	5
Taste	9	9	9	7	5
Texture	9	9	9	9	9
Juiciness					
Total evaluation	9	9			

The results in Table 4 indicate that the increase of the protein amount deteriorates some of the organoleptical properties and has a negative effect on the overall evaluation. That is why, the amount of the additive has to be carefully optimized to avoid undesirable effect on the products' organoleptics.

CONCLUSIONS: 1. The addition of hydrated combined protein preparation (based on gluten and defatted milk) in meat for dietary sausages improves the water-holding capacity of the stuffing mass.

2. The finished product with a protein additive better corresponds to the medico-biological requirements of dietary nutrition for people suffering from obesity.

3. The protein additive amount has to be optimized (between 3 and 5%) in order to obtain a finished product with desirable organoleptical properties.

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