

Study chemical and vitamin composition of horsemeat cutlets with addition of pumpkin

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ABSTRACT--The most diverse division of the meat industry is the production of semi-finished meat products. This paper presents semi-finished meat product formulation and processing technology from horsemeat with the addition of vegetable filler-pumpkin. The pumpkin content in the recipe ranged from 0 to 30%. Analysis of chemical composition showed that the content of moisture, carbohydrates and fat increased to 74.24%, 4.79% and 1.91% when the dose of pumpkin in cutlet recipe increased to 30%. The addition of pumpkin to the meat cutlet recipe significantly increases the vitamin C and A content. Group B vitamins show small variations from the control sample.

Key words--pumpkin, horsemeat, cutlet, carbohydrate, formulation

I. INTRODUCTION

Meat and meat products are among the most nutritionally well known foods that are essential to the nutrition of modern humans as being biologically complete. It is proved that meat and meat products contains in considerable quantity all essential amino acids [1]. The production of meat semi-finished products can be referred to as one of the most dynamically developing branches of meat industry. Meat semifinished products are products of a healthy diet, as their combined composition delivers a formulation with the desired commodity characteristics, balanced amino acid, mineral and vitamin composition [2, 3].

At present, the improvement of the technology and the expansion of the range of meat products is of particular importance. The important problem for food industry is search of the new technological decisions connected with meat processing, and introduction at the enterprises of modern approaches on use of food components [4, 5]. The developed products should not only satisfy the consumer with the balanced composition in terms of food value, but also correspond on organoleptic indicators to traditional products from poultry, beef, pork meat [6, 7].

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The manufacture of mixed semi-finished goods with the use of animal and plant origin proteins not only extends the product range but also facilitates the appropriate use of raw materials, providing quality food to the population[8]. Improving meat product recipes by enriching with plant raw materials allows for improving population nutrition, making it more complete and rational[9, 10].

Developing meat semi-finished product recipes assuming that part of the animal raw materials are substituted by plant additives is a perspective way of determining the problem of increasing the availability of meat products, extending their variety and raising the nutritional value. Pumpkin is one of kinds of plant raw materials.

Pumpkin-an important dietary product which is particularly useful for problems with the liver, urinary and gall bladder, gout, colitis and other edema-related diseases. Pumpkin ranks first among vegetables, in terms of carotene content. In the body carotene becomes vitamin A under the influence of enzymes. Carotene supports proper functioning of liver and pancreatic mucous membranes[11]. The most valuable quality of fruits is the content of soluble solids. Among the water-soluble vitamins the pumpkin contains: vitamin C (ascorbic acid) - an important component of redox processes in the body, increasing its protective reactions, vitamin PP (niacin, nicotinic acid), regulating digestion, liver function, cholesterol metabolism and the formation of red blood cells. The regulation of carbohydrate and fat metabolism involves vitamins: B1 (thiamine), B2 (riboflavin), B3 (pantothenic acid), H (biotin). Vitamin B4 (choline) is involved in fat metabolism, B 8 (inositol) normalizes metabolism in the nervous tissue, stimulates intestinal activity, reduces the content of cholesterol in the blood. The pumpkin contains a number of micro- and macroelements that regulate the heart, water and salt regime of the human body [12, 13].

The pumpkin contains dietary fibres - non-starchy polysaccharides that are not digestible in the small intestine, such as cellulose, hemicellulose, pectins, gummi, mucus and non-hydrocarbon lignin. Food fibres are able to adsorb and remove various compounds from the body, including exo and endogenous toxins, heavy metals. The absence of dietary fiber in the diet can lead to diseases such as colon cancer and other parts of the intestine, atherosclerosis, hypertension, diabetes [14].

The aim of this work is to study the impact of pumpkin on the chemical and vitamin composition of horsemeat cutlets.

II. MATERIALS AND METHODS

Production of meat cutlets

The ingredients are prepared according to the recipe (Table 1). Horsemeat is washed, deboned, trimmed and grinded on a meat chopper with a diameter of 2-3 mm plate holes. The rest of the ingredients (pumpkin, onion, garlic) are also passed through the meat chopper. Weighted ingredients are loaded into a mincer and mixed for 6 minutes until a homogeneous mass is obtained. During the mixing process eggs and bread loaves soaked in milk are added. The temperature of the finished minced meat must not exceed 12°C. Then send the cooked minced meat to the forming process. After molding, cutlets are placed on trays, which are evenly sprinkled with a thin layer of breadcrumbs, and the surface of the cutlets is coated with breadcrumbs.

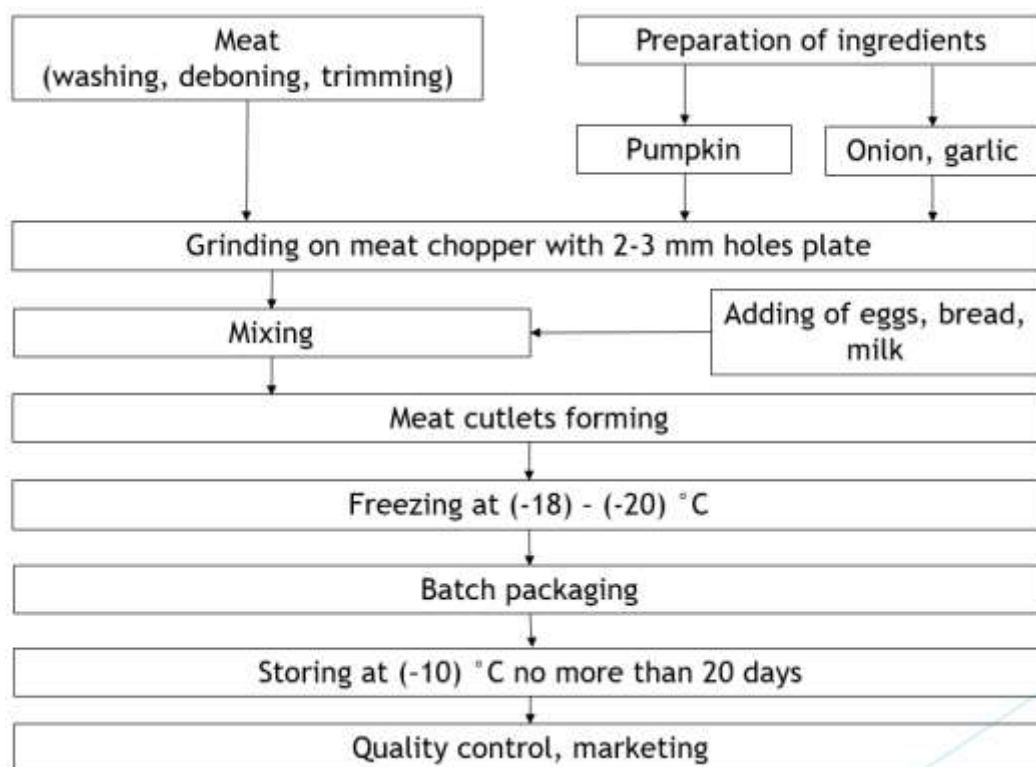


Figure 1: Manufacturing scheme for frozen meat semi-finished product

After molding, meat semi-finished products are transported to the quick-freezer. Semi-finished products are frozen in the machine at a temperature of $-30 \dots -35^{\circ}\text{C}$. Semi-finished products are released into production with the temperature in the thickness of the product not exceeding -10°C . Semi-finished products are packed in bags made of polymeric film materials.

Table 1: Recipe of meat cutlets samples

Ingredients (%)	Samples			
	Control	1	2	3
Horsemeat	70	60	50	40
Pumpkin	0	10	20	30
Onion	10	10	10	10
Garlic	0,6	0,6	0,6	0,6
Egg	2	2	2	2
Bread	4	4	4	4
Milk	8	8	8	8
Flour (for coating)	5	5	5	5
Salt	0,3	0,3	0,3	0,3
Black pepper	0,1	0,1	0,1	0,1
Total	100	100	100	100

The chemical and vitamin composition is determined in accordance with the methods specified in [15, 16].

III. RESULTS AND DISCUSSION

At the initial stage, the chemical composition of the minced meat prototypes was analyzed. Based on the results of analysis of the chemical composition (Table 2), it was found that as the amount of pumpkin in the recipe of minced meat increases the content of moisture, carbohydrates and ash increases as well. This trend is explained by the chemical composition of the pumpkin. It is known that pumpkin contains up to 92% moisture, 2,5% ash and 4,4% carbohydrates. So, if without pumpkin in the formulation of cutlets the amount of moisture, carbohydrates and ash in the meat cutlet was 68,54 %, 3,47 % and 1,46 %, then with increasing the dose of pumpkin up to 30 % in the recipe of cutlets, these parameters increased to 74,24 %, 4,79 % and 1,91 % respectively (Fig. 2).

Table 2: Effect of pumpkin content on chemical composition of horsemeat cutlets

Proportion of pumpkin in formulation of the experimental cutlets (in %)	Moisture	Protein	Fat	Ash	Carbohydrate
0	68,54	20,249	6,283	1,4616	3,47
10%	70,44	18,209	5,833	1,6116	3,91
20%	72,34	16,169	5,383	1,7616	4,35
30%	74,24	14,129	4,933	1,9116	4,79

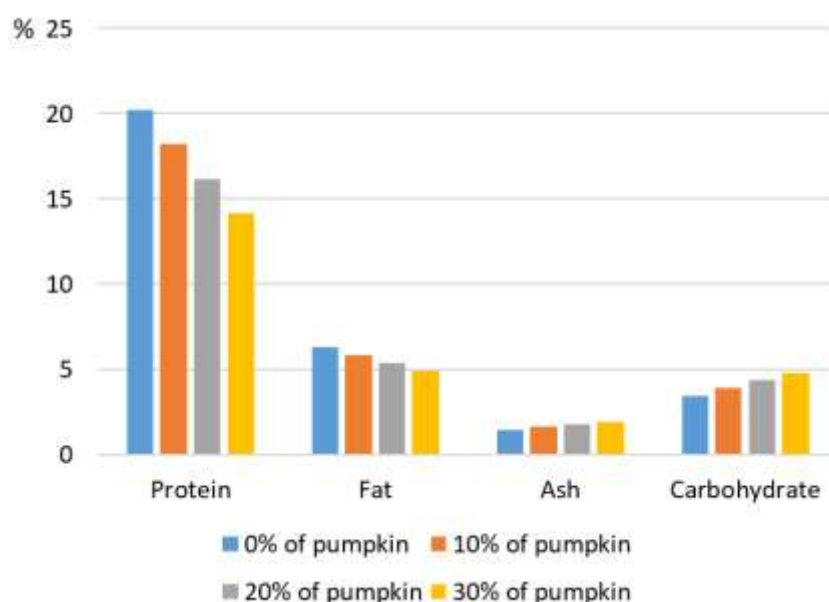


Figure 2: Change in the chemical composition of meat cutlets depending on the amount of pumpkin

In work [17] the chemical composition of cutlets with the addition of buckwheat flour is presented, where the content of protein, fat and moisture was 13.26%, 18.87% and 61.1%, respectively. The use of different types of

flour in semi-finished products leads to the enrichment of the product with vegetable protein, as well as vitamins, macro-and micronutrients necessary for the body.

Levina et al. produced cutlets from turkey meat with the addition of oat flakes in quantities of 5%, 7% and 10%. The data showed that the developed cutlets have a high protein content (16.73%, 16.93% and 17.34%) before and after storage within thirty days (17.83%, 18.03% and 19.17%) compared to the control sample [18]. Cutlets, which include goose meat, quince, and wheat bread in the recipe, contain 12.5% protein, 11.3% fat, 65.5% moisture and 5.10% carbohydrates [19].

According to the vitamin composition, the addition of pumpkin significantly increases the content of vitamin C from 0.804 mg/100g in the control sample without pumpkin to 2.904 mg/100g with the addition of 30% pumpkin. In addition, there is an increase in vitamin A by 76 times: from 0.007 mg/100g in the control sample without pumpkin in the formulation to 0.532 mg/100g with the addition of 30% pumpkin.

Table 3: Vitamin composition of horsemeat cutlets depending on the amount of pumpkin

Proportion of pumpkin in formulation of the experimental cutlets (in %)	A	B ₁	B ₂	B ₆	B ₁₂	C	PP
0	0,007	0,1	0,092	0,2788	0,0445	0,804	3,44
10%	0,182	0,092	0,088	0,2538	0,0442	1,504	3,05
20%	0,357	0,084	0,084	0,2288	0,0439	2,204	2,66
30%	0,532	0,076	0,08	0,2038	0,0436	2,904	2,27

Vitamin C (ascorbic acid) is a water-soluble biologically active organic compound, a potent antioxidant. Vitamin C enhances and protects the human immune system from viruses and bacteria, promotes the wound healing process and stimulates the synthesis of many hormones[20]. In addition, it regulates the processes of hematopoiesis and normalizes capillary permeability, participates in the synthesis of collagen protein, which is necessary for the growth of cells of tissues, bones and cartilage of the body, regulates metabolism, removes toxins, improves bile secretion, restores the external secretory function of the pancreas and thyroid [21].

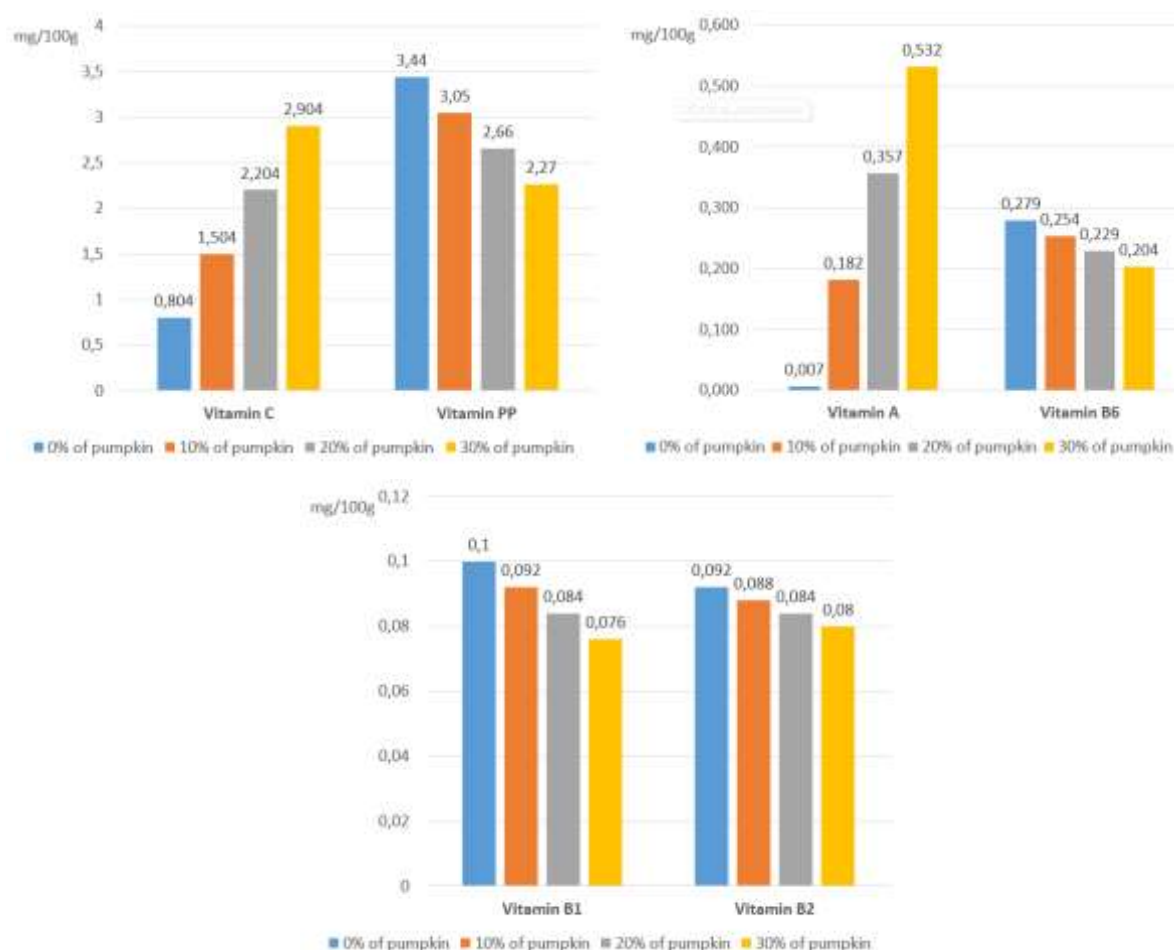


Figure 3: Change of vitamin composition of horsemeat cutlets depending on the amount of pumpkin

Vitamin A or Retinol is a vitamin that is fat-soluble and serves as a strong antioxidant and involved in redox processes. It influences protein synthesis, prevents premature aging, and influences fat metabolism and bone system and teeth formation [22]. The benefits of vitamin A for the human body are quite high, as it has a positive effect on the immune, digestive, and respiratory systems, as well as on vision and skin condition. This vitamin is actively used to treat various skin diseases, as well as diseases of the heart and blood vessels. Vitamin A contributes to the normal operation of the endocrine system and is an excellent prophylactic agent for diseases such as anemia [23].

In general, the addition of pumpkin to the recipe of meatballs significantly increases the content of vitamin C and A. Vitamins of group B have minor deviations from the control sample.

IV. CONCLUSION

The manufacture of semi-finished meat product containing animal and plant proteins would not only allow the product range to be extended but also the production of a functional product. The use of pumpkin in the meat cutlets recipe improves the final product's nutritional value by enriching it with carbohydrates, minerals, and vitamins.

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