

WAYS TO INCREASE THE NUTRITIONAL VALUE OF CULINARY DISHES

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Abstract: Every year the demand for food in restaurants is growing. This is due to the rhythm and lifestyle of the working population. Therefore, the task of restaurants is to provide guests with a balanced diet. Due to the requirements of nutrition, the range of functional and health dishes should be expanded. The raw material that gives dishes such properties are vegetable meal. The use of vegetable meal in the amount of 15 % by weight of flour in the recipe of pancakes is proposed. A standard recipe for pancakes was used for the study. Experiments to determine the rheological properties of the dough were performed using a viscometer "Reotest-2". Determination of nutritional and biological value was performed according to generally accepted methods in Microsoft Excel. It has been found that the application of vegetable meal in the amount of 15 % increases the viscosity of the dough. It is proved that when eating a portion of pancakes with the addition of vegetable meal, the daily requirement for dietary fiber is sometimes up to 40 %, and protein - up to 30 %. It has been found that replacing 15 % of wheat flour with vegetable meal in a pancake recipe balances the ratio of polyunsaturated fatty acids. Eating a portion of pancakes with vegetable meal increases the body's daily supply of vitamins and essential macronutrients.

Keywords: *fiber, meal, pancakes, pumpkin, viscosity*

INTRODUCTION

Nutrition is the most important physiological need of the human body, the satisfaction of which largely determines the state of health and quality of life. Constant environmental problems, stress, fast pace of life, unhealthy diet leads to disease. In particular, the issue of creating health products for health and prevention purposes is relevant [1].

Given the rapid spread of diseases such as obesity, diabetes and the general imbalance of the diet of modern man, the development of dietary and functional products enriched with biological substances is relevant. One of the possible directions is the use of plant raw materials rich in fiber and protein [2].

According to the WHO, in Europe, about 80 % of diseases, including cardiovascular, endocrine, cancer, are directly related to insufficient intake of nutrients [3].

Thus, the main guarantee of maintaining and strengthening health is a complete balanced diet that will ensure the health of the nation and increase life expectancy. Nutrition ensures the harmonious development of children and adolescents, maintains a high level of health of the working population, helps to prolong an active lifestyle in the elderly. Prevention of nutritional disorders is to follow the rules of nutrition and consumption of foods that are balanced in biological value. Therefore, the urgent task is to expand the range of functional foods, which will have a significant social effect. In order to develop food products in accordance with the requirements of nutrition, it is necessary to use physiologically functional raw ingredients (dietary fiber, vitamins, minerals, non-starch polysaccharides) [3].

One of the ways to improve the nutritional value of food is the use of sesame, sea buckthorn, hemp pumpkin meal and milk thistle meal.

Milk thistle is rich in valuable substances. Milk thistle meal contains silymarin, which includes silibinin, silidianin, silicristin and other flavolignans. According to the biochemical classification, they are flavonoids. These biologically active substances help to strengthen the walls of blood vessels, participate in redox processes and have anti-inflammatory, antiulcer, antioxidant properties. Clinical studies have proven the hepatoprotective effect of silymarin - the ability to protect liver cells from various adverse effects (toxins, ischemia, radiation, viruses) [4].

Applying pumpkin seed meal enriches food with a significant amount of protein and gives them functional properties due to fiber. Pumpkin seed meal contains a large amount of fiber, the consumption of which has a significant impact on the health of the human body. Regular consumption of fiber can lower blood cholesterol, reduce the risk of atherosclerosis, diabetes, cardiovascular and cancer [2].

The composition of sea buckthorn meal includes essential amino acids: leucine, tyrosine, lysine, phenylalanine; vitamins of group A, B, PP, C; minerals [5].

Sesame meal is a valuable source of dietary fiber, micro- and macronutrients [3].

According to various sources, the amount of protein in flax meal can range from 25 to 54 %. Flax meal protein is water-soluble and has a high biological value due to a balanced amino acid composition close to soy protein, which is considered the best among plant proteins. Flax meal proteins in amino acid composition may not be enough to supplement the protein of wheat flour. The increased content of such important amino acids as tryptophan and sulfur-containing (methionine, cystine) compensate for their content in wheat protein.

Flax dietary fiber has the ability to absorb water 4-6 times its own weight, bind and excrete harmful substances, interfere with the rapid absorption of glucose in the small intestine and is a nutrient medium for the beneficial intestinal microflora. Lignans are also valuable components of meal. Lignans are phenolic compounds that are natural plant hormones that have antioxidant, antiallergic, antibiotic and fungicidal properties. In the human body, lignans neutralize special enzymes produced by the liver during the digestion of harmful products. If these enzymes are not blocked, then over time they can cause malignant tumors. Due to the presence of lignans, flax and its products have an anti-cancer effect. Daily consumption of flaxseed lignans may lower blood sugar in adult patients with type 2 diabetes [6].

So, today it is important and necessary to have a balanced diet of the world's population. Therefore, a progressive direction in the development of restaurants is the introduction of healthy and functional nutrition. In addition to the scientifically based need for functional nutrition, many people have realized the feasibility of introducing functional ingredients into their diet. But the modern rhythm of life does not always allow to provide the body with nutrients in time, and even more so with functional products. Given the fact that every year more and more people prefer food in restaurants, expanding the range of dishes by the latter is a promising direction.

In addition, during tourist trips it is common to stay in hotels where breakfast is included. Quite popular are tourist trips to the hotel and restaurant industry, where accommodation provides an "all inclusive" system. Thus, meals are fully provided by the restaurant menu of a complex.

Due to the variety of offers on the market of the hotel and restaurant industry, complexes or simply catering establishments strive to be competitive and popular.

Therefore, the aim of the work is to investigate possible ways to enrich pancakes with nutrients and to develop a product of functional action.

Therefore, the task of this work is to analyze the chemical composition of vegetable meal, to investigate changes in the viscosity of the dough during the dosing of meal, to investigate the change in chemical composition as a result of the introduction of meal.

MATERIALS AND METHODS

Given the fact that most restaurants offer a continental breakfast, which is characterized by the presence of pancakes, it is proposed to explore possible ways to increase the nutritional value of this dish. The recipe for pancakes per 100 g of finished products includes high-grade wheat flour 41.6 g, eggs 8.3 g, milk 104 g, salt 8 g, sugar 25 g.

Determination of nutritional and biological value was performed according to generally accepted methods in Microsoft Excel. The effect of meal on the visco-plastic properties of the test system was investigated using a rotary viscometer "Reotest - 2". The dependence of the change in viscosity on the value of the shear stress was determined. The method is based on measuring the viscosity of a semi-finished product placed between two surfaces. During the research, model samples were prepared with the addition of 10, 15 and 20 % meal to the mass of flour. The control sample was without the addition of meal. The determination was performed immediately after mixing the test system. S1 cylinders were used in the work.

RESULTS AND DISCUSSION

According to table 1, vegetable meal differs in chemical composition, but the common feature is that they contain large amounts of fiber. Compared with wheat flour, the fiber content in meal is 10-17 times higher. In addition, the protein in the presented meal is 1.6-5 times more than in premium wheat flour.

Table 1. Chemical composition of wheat flour and vegetable meal [4, 7 - 12]

Nutrients and biologically active substances	Premium wheat flour	Vegetable meal				
		sesame	sea buckthorn	milk thistle	pumpkin	flax
Protein [%]	10.3	50.1	22.0	21.9	16.0	32.6
Fatty acids [%]						
- linoleum	12.0	0.5	1.8	3.3	3.0	2.4
- linolenic	0.69	3.1	2.9	0.9	3.6	5.4
Cellulose [%]	3.5	45.0	59.1	35.0	52.0	37.6
Vitamin, [mg/%]						
- E	1.5	0.7	1.6	4.7	2.1	4.8
- B ₁	0.17	2.5	0.4	0.3	0.27	0.6
- B ₂	0.04	0.27	0.25	0.3	0.15	0.3
- B ₃	-	12.6	0.4	2.0	4.4	3.1
- B ₆	0.17	0.14	0.11	-	0.14	-
- B ₉	0.027	0.03	0.01	0.1	0.06	-
Minerals [mg/%]						
- Fe	1.2	16	0.33	14.6	8.8	4.2
- P	86.0	720	44	965	1233	-
- Mg	16.0	540	92	10	592	461
- Ca	18.0	1474	8.2	1660	46	256
- K	122.0	397	530	920	809	725
- Na	3.0	75	13	4	-	-
- Zn	0.7	7.8	0.04	-	7.8	3.2

The content of vitamins E and B₁ in the presented meal significantly exceeds their content in wheat flour. The only exception is the tocopherol content in sesame seed meal, which is twice lower than in flour.

The colloidal system, which is the dough, is characterized by visco-elastic properties along with elastic properties. According to the research results, the curves of viscosity changes from the value of the shear stress were constructed (Figure 1).

It has been found that in samples with meal application, the viscosity of the system increases. Thus, in the study of the effect of sesame seed meal on the viscosity of the dough, it was found that with the introduction of 10 % of SSM, the viscosity of the dough increases 1.8 times compared to the control. When the SSM is dosed at 20 %, the viscosity increases 4.5 times.

When adding 10 % by weight of sea buckthorn meal to the dough, the viscosity of the system does not increase significantly (1.3 times). And when you increase the dosage of meal to 20 %, the viscosity of the dough increases 3 times compared to the control.

The study found that milk thistle meal did not significantly affect the viscosity of the dough. Even when the meal is dosed at 20 % by weight of the flour, the viscosity of the dough only doubles.

It should be noted that pumpkin seed meal has the greatest impact on the rheological properties of pancake batter. Adding 10 % of PSM to the dough increases the viscosity of the dough 3.7 times and adding 20 % of PSM increases the viscosity of 6 %.

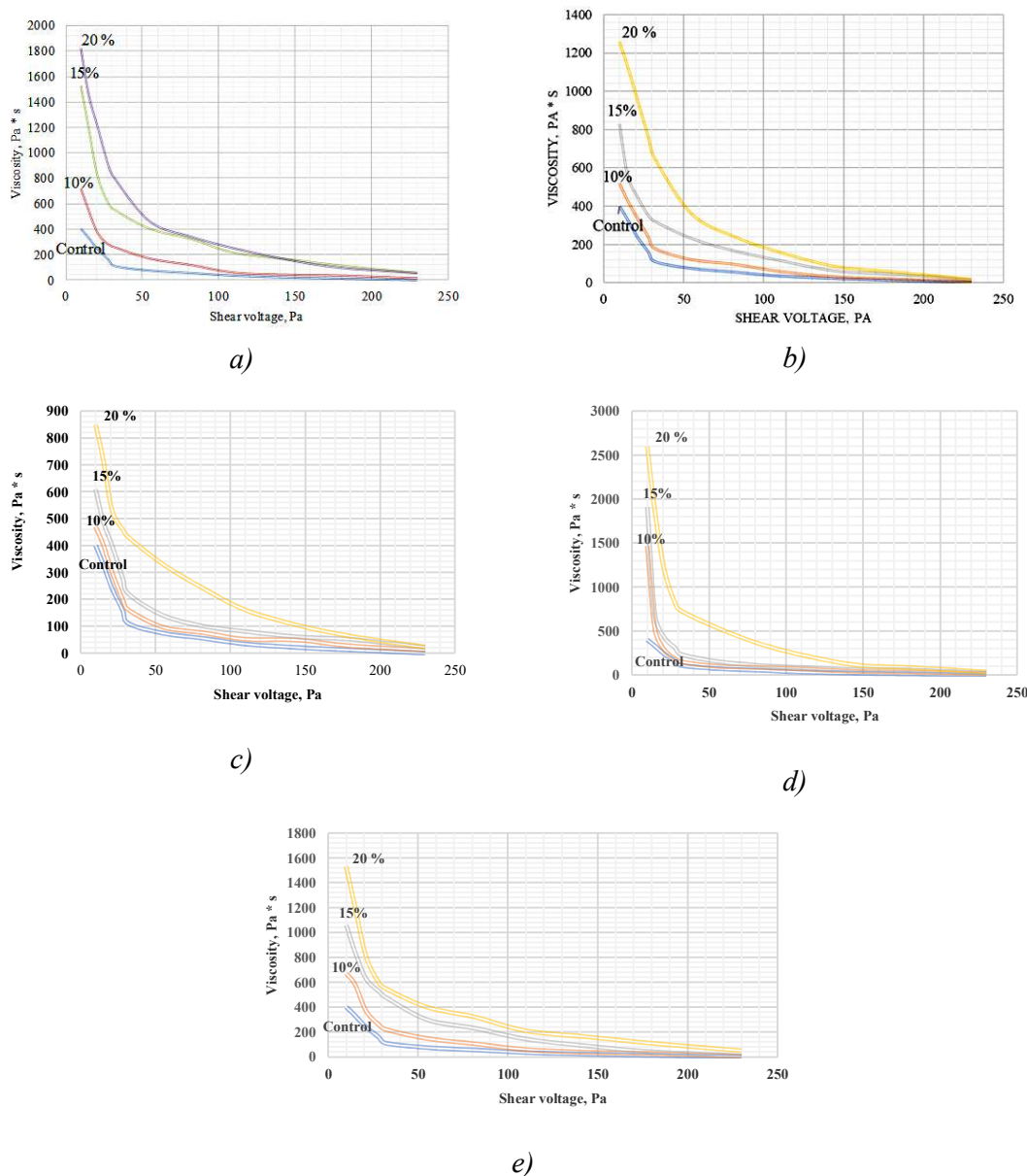


Figure 1. Rheological viscosity curves of the dough with the addition of:
a) sesame seed meal (SSM); b) sea buckthorn fruit meal (SBFM);
c) milk thistle meal (MTHM); d) of pumpkin seed meal (PSM);
e) flax seed meal (FSM)

When 10 % FSM is added to the dough, it is found that its viscosity increases 1.7 times. When the dosage of FSM is increased to 20 %, the viscosity of the dough is increased by 3.8 times compared to the control.

After conducting a number of studies, organoleptic and physicochemical, as well as taking into account changes in the viscosity of the dough, it was found that a rational solution is to dose the meal in the dough for pancakes in the amount of 15 %.

New recipes for pancakes were studied for the content of essential nutrients and essential substances. The results are presented in Table 2.

Table 2. *The content of biologically active substances in pancakes*

Nutrients and biologically active substances	Control	Pancakes with SSM	Pancakes with SBFM	Pancakes with MTHM	Pancakes with PSM	Pancakes with FSM
Protein [%]	8.7	11.2	9.4	9.4	9.0	10.1
Cellulose [%]	1.5	4.1	5.0	3.4	4.5	3.6
Linoleic acid [%]	5.2	4.5	4.5	4.6	4,6	4,6
Linolenic acid [%]	0.32	0.5	0,5	0,33	0,5	0,6

It was found that the introduction of vegetable meal in the recipe of pancakes increases their content of protein, fiber and polyunsaturated fatty acids. The daily requirement for men of the I group of physical activity at the age of 30 - 39 years is 75 g. [13]

Thus, when consuming one portion of pancakes with SSM without filling (200 g), the daily requirement for protein is covered by 30 %, with SBFM and MTHM – by 25 %, with PSM - by 24 %, with FSM - by 27 %. Whereas the consumption of a portion of pancakes without the addition of meal provides a daily protein requirement of only 23 %. The daily requirement for dietary fiber is 25 g. [14]

Eating a portion of pancakes without the addition of meal covers the daily requirement of dietary fiber by 12 %. The addition of SSM to the recipe of pancakes will increase the body's daily supply of dietary fiber to 33 %, SBFM – to 40 %, MTHM and FSM – to 27... 29 %, PSM – to 36 %.

It is known that the optimal ratio of ω -6 and ω -3 fatty acids is 4...10 : 1. [15]. The introduction of vegetable meal into the recipe of pancakes significantly increases the biological efficiency of the fat of the finished dish. In all samples, the ratio of ω -6 and ω -3 fatty acids is optimal and is 9... 10: 1. The exception is the recipe containing milk thistle meal. However, when made in the pancake with MTHM, this ratio of polyunsaturated fatty acids is much closer to optimal, as it is 14 : 1. Whereas in the control the ratio of ω -6 and ω -3 fatty acids is 16 : 1.

To assess the vitamin composition of the obtained samples with vegetable meal, the data are presented in the form of diagrams (Figure 2).

The obtained data indicate that the introduction of vegetable meal into the dough increases the content of macronutrients in pancakes. The level of the body's daily requirement of macronutrients is presented in the form of a pentagonal area in the diagrams. The area of this area indicates the level of daily needs. That is, the smaller the area of this area, the lower the level of daily requirement for macronutrients (Figure 2a). The larger the area is, the greater the level of coverage of daily needs requirement of macronutrients.

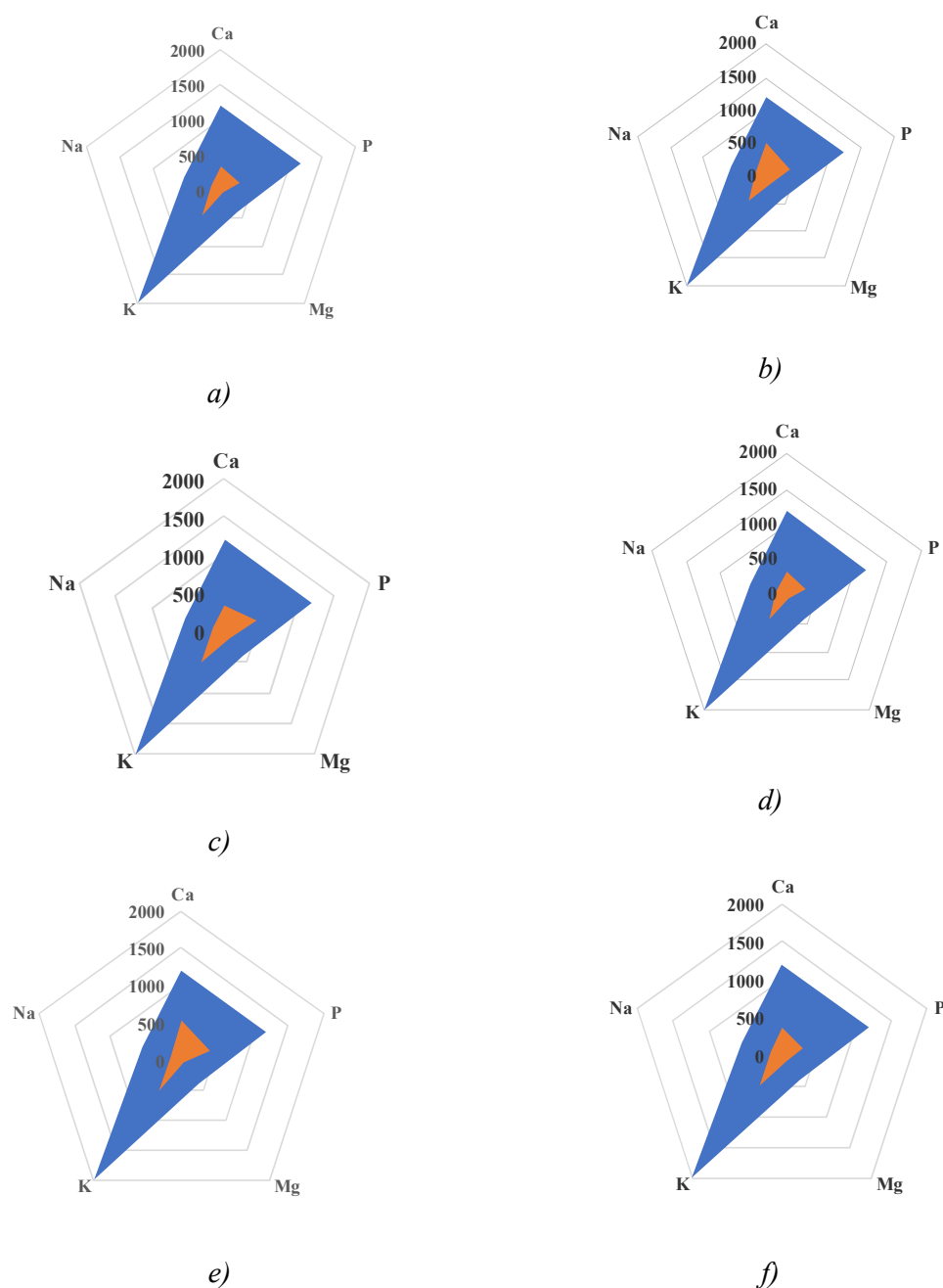


Figure 2. Providing the body with a portion of pancakes with macronutrients and their daily requirement
(a - control, b - recipe with SBFM, c - recipe with SSM, d - recipe with MTHM, e - recipe with PSM, f - recipe with FSM)

The amount of vitamins in the developed is presented in Table 3.
The inclusion of vegetable meal in the recipe of pancakes helps to increase the level of vitamins. There is a doubling of thiamine in the formulation with SSM compared with

the control. It was found that vegetable meal contributes to an increase in niacin in pancakes by 2.5 - 6 times.

Table 3. *Vitamin content per serving of pancakes*

Vitamins [mg]	Control	Pancakes with SSM	Pancakes with SBFM	Pancakes with MTHM	Pancakes with PSM	Pancakes with FSM
E	1.6	1.5	1.6	2.0	1.6	2.0
B ₁	0.24	0.53	0.27	0.3	0.25	0.3
B ₂	0.14	0.2	0.17	0.18	0.16	0.18
B ₃	0.28	1.9	0.33	0.5	0.8	0.7
B ₆	0.32	0.32	0.32	0.3	0.32	0.3
B ₉	0.023	0.02	0.02	0.03	0.03	0.02

CONCLUSION

Thus, according to the results of research, it is established that vegetable meal is a valuable raw material for enriching culinary dishes with proteins, dietary fiber and more. It has been found that the application of vegetable meal in the amount of 15 % increases the viscosity of the dough. This is most true for recipes with pumpkin and sesame meal.

It is proved that when eating a portion of pancakes with the addition of vegetable meal, the daily requirement for dietary fiber is sometimes up to 40 %, and protein - up to 30 %.

It has been found that replacing 15 % of wheat flour with vegetable meal in a pancake recipe balances the ratio of polyunsaturated fatty acids.

When eating a portion of pancakes with vegetable meal increases the body's daily supply of vitamins and essential macronutrients.

Therefore, the use of vegetable meal in cooking is an extremely important and promising area of providing the body with essential substances.

Further research should be aimed at expanding the range of culinary dishes with the addition of vegetable meal and expanding the range of meal used.

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