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# STUDY OF THE EFFECT OF POWDERED FOOD ADDITIVES FROM WILD BERRIES ON THE QUALITY OF PASTA

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**Abstract.** The purpose of the study is to investigate the effect of powdered food additives from sea buckthorn (*Hippophae Rhamnoides L.*) and mountain ash (*Sorbus Aucuparia*) on the quality of pasta. The pasta was made from durum wheat flour with the addition of powders from sea buckthorn and mountain ash in the amount of 5%, 10% and 15%. The article analyses the organoleptic and physicochemical parameters, fibre content, vitamin C and amino acid profile of the pasta samples. The organoleptic evaluation showed that the rational amount of the additive is 10%. The surface of the test products was smooth, with a slight roughness; the shape corresponded to the type of product (long ribbon-like products formed into nests). The colour of the pasta is monochromatic, with a hint of added vegetable powder, without traces of unleavened product. The taste and smell are specific, characteristic of the added vegetable powder, without any off-flavours. An increase in the additive content to 15% leads to a deterioration in the quality of pasta products due to increased fragility and an overly bright smell and taste typical of the added berry powder. The study of the content of the main nutrients revealed that the developed pasta samples contain more fibre (3.2% in sea buckthorn and 3.1% in rowan) than the control samples. The results of the study showed that with an increase in the concentration of berry powders, the content of vitamin C in the experimental pasta samples increased to 0.51 mg/100 g in sea buckthorn pasta, 0.15 mg/100 g in rowan pasta. In the experimental samples of pasta, 17 amino acid residues were identified. Studies of microbiological parameters and the content of toxic elements showed acceptable values for this type of product. Based on the results of the comprehensive experimental studies, a significant increase in the nutritional and biological value of pasta with the addition of powdered food additives from wild berries was demonstrated. The recommended amount of added powders in the pasta recipe is 10%. This will ensure acceptable sensory properties of the finished pasta. It has also been found that the addition of plant powders from wild berry processing derivatives in the amount of 10% improves the amino acid profile of finished products.

**Keywords:** pasta, vegetable raw materials, fruit processing products, powdered food additives, fibre.

## Introduction. Formulation of the problem

Pasta is the most popular food in the world due to its flavour, ease of preparation, low cost and long shelf life [1].

Most pasta products are made from refined flour, which is rich in digestible carbohydrates. These raw materials are low in fibre and other biologically active compounds such as phenolic compounds, minerals and vitamins.

In recent years, there has been a global trend towards the consumption of cereal products enriched with various plant-based additives [2]. Plant raw materials are a source of many bioactive compounds such as phenolic compounds, vitamins, other phytochemicals that have a positive effect on human health and can reduce the risk of many diseases [3, 4].

According to statistical data [5], more than 14.3 million tonnes of pasta products are produced annually in the world, and this figure is increasing. Traditional pasta is made of flour, both with and without gluten, characterised by low protein content. And also, do not contain essential nutrients such as dietary fibre, vitamins and minerals, biologically active substances [6, 7].

As pasta consumption is increasing, it is an ideal product to be enriched with functional ingredients to supplement nutrients in people's diets. However, the use of additional ingredients in pasta formulation may affect the quality of pasta products, resulting in reduced consumer acceptability.

## Analysis of recent research and publications

The analysis of information sources has shown that the study of the influence of various vegetable powders on the quality parameters of pasta products attracts a number of foreign and domestic scientists. Most studies are focused on determining the possibility of replacing flour with vegetable powders in order to enrich pasta products with biologically valuable compounds such as minerals, vitamins, phenolic compounds and the like.

As the demand for healthy food has recently increased significantly worldwide and the reduction of secondary products has been actively promoted. Many scientists are developing food products enriched with bioactive substances, which are made from the products of fruit processing, in particular, grape and apple pomace, potato skins, tomato and carrot pomace, onion husks and others [8].

The paper [9] considers the possibility of using flax seed components for pasta production. The authors substantiated that flax meal obtained during the production of flaxseed oil can be an important source of nutritious ingredients in pasta technology. The results of the chemical composition of pasta products enriched with flax products indicate a significant increase in the content of protein, fat and dietary fibre in pasta products, without affecting their quality.

In [10] the influence of adding products of pear, dates and apples processing on the quality parameters of pasta products was investigated. Researchers found that the chemical composition of pasta with fruit components was characterised by a higher energy value and fibre content than control pasta samples. However, the high content of pear, date and apple products in the pasta formulation (2.5–10%) markedly changed the shape of pasta during cooking, which negatively affected the sensory acceptability of the finished products.

In [11], beer pellet, a secondary product of the brewing industry, was used to increase the nutritional value of pasta products. The authors found that the use of beer pellets led to an increase in fibre, β-glucan and phenolic compounds in enriched pasta. At the same time, a minimal effect on the sensory properties of cooked pasta was observed, namely a slight decrease in the optimal cooking time, hardness, and colour of pasta.

Paper [12] presents a study of the possibility of using onion peel in the technology of making pasta. The authors evaluated the impact on the chemical composition, technological and sensory properties of enriched pasta samples compared to the control sample. The results of the study show that onion peel powder can be a potential alternative for the production of fortified pasta, as the finished products are characterised by an increase in the content of dietary fibre, ash, total phenolic compounds, flavonoid content and antioxidant activity.

The effect of elderberry, viburnum, and sea buckthorn powders obtained by osmotic dehydration on the organoleptic properties of pasta and its moisture content was investigated [13]. However, there are no studies on the effect of these additives on the biological value of finished pasta.

The paper [14] presents a technology for obtaining powder from wild berry processing products based on osmotic dehydration of raw materials. The authors experimentally confirmed that in addition to reducing the drying period, osmotic dehydration maximally preserves the biological and nutritional value, taste and aromatic properties of berry products and their natural colour. This technology makes it possible to use the obtained powders as natural food additives in various branches of the food industry.

Thus, the analysis of information sources confirms the positive effect of fruit and seed processing products on the quality parameters (organoleptic, nutritional and biological value) of pasta products. However, there are no studies on the effect of powdered food additives of wild fruits - products of processing of wild plant raw materials processed by osmotic dehydration on the nutritional and biological value of pasta products.

**The purpose and objectives of the study.** The purpose of the study is to investigate the effect of powdered food additives from sea buckthorn (*Hippophae Rhamnoides L.*) and mountain ash (*Sorbus Aucuparia*) on the quality of pasta.

To achieve this goal, the following research objectives were developed:

1. to investigate the influence and proportions of powdered food additives from wild berries *Hippophae Rhamnoides L.* and *Sorbus Aucuparia* on organoleptic and physico-chemical parameters of pasta products;
2. to analyse the nutritional and biological value of enriched pasta products;
3. to establish the compliance of the developed pasta products with safety indicators in accordance with current standards.

## Research materials and methods

The pasta products were made from durum wheat flour with the addition of powdered food additives from the fruits of wild berries *Hippophae Rhamnoides L.* and *Sorbus Aucuparia.*

For production of enriched pasta products used flour from durum wheat varieties according to TU U 82.9-4560700-002:2014 (La Pasta Per Primi, Ukraine), table salt according to DSTU 3583:2015 (LLC ‘Ukrainian Product’, Ukraine), drinking water according to TU U 15. 9-32367564-001:2011 (LLC ‘Plant “Ivolzhanskie vody”, Ukraine), powder food additives according to TU U 10.89.19-04718013-001:2023 (developer Sumy National Agrarian University, made in laboratory conditions).

The technological process of powdered food additives production provides the following technological processes: fruit preparation (washing and sorting); freezing; defrosting; preparation of sugar solution; pasteurisation of sugar solution; osmotic dehydration; separation of sugar solution; drying of berry processing derivatives; grinding; sieving; packing [14].

Recipe of the developed pasta products is presented in Table 1.

The pasta products were produced according to the classical scheme. First, the preparation of raw materials was performed: flour and food powders were sieved, drinking water was heated to a temperature of (55±2) °C. The prepared ingredients were mixed using a *Kenwood KMX750WH* food processor. The dough kneading process lasted 15–20 minutes ($t_{dough}$=(46±2) °C) in the bowl of a food processor, using the dough hook attachment. Afterwards, the bowl was covered tightly with food film for 7–8 minutes (vacuuming process of the pasta dough). As a result, a dense dough is obtained, which is further rolled out to a dough sheet thickness of 0.5–1 mm using the dough rolling nozzle of the *Supretto pasta machine*. The obtained dough sheets were cut into 6 mm wide strips with a length of 200 mm using another nozzle (for noodles). The obtained dough strips were twisted into 'nests' and placed on grids. Drying of pasta products was carried out in an infrared laboratory dryer at a temperature of (65±2)ºC for 3–4 hours (moisture content should be no more than 13%). The obtained dry pasta products are cooled (stabilisation process) at temperature (22±2) °C and air humidity 60–65%, for 4 hours. The obtained pasta products (long ribbon-shaped products formed into nests) were packed into polyethylene ZIP bags and stored at a temperature not exceeding 20 °C until the study.

Experimental research and recipe development were carried out in the laboratories of the Faculty of Food Technologies of Sumy National University, as well as departments of food products expertise of SE 'Sumystandardtmetrology'.

Organoleptic and physico-chemical parameters of finished pasta products were determined by generally accepted research methods.

Organoleptic parameters of pasta samples were determined according to DSTU 7043:2020. The analysis is based on determining the quality of experimental samples of pasta products by descriptive and sensory-profile method by an expert group of 9 people. During the sensory analysis, the commission of experts characterised the appearance, colour, taste and smell, shape of pasta products, as well as their sensory characteristics after cooking (appearance, colour, taste and smell, shape, hardness, sticking and formation of lumps). The intensity of each indicator was determined using a 5-point scale (0.0–0.9 – no sign; 1.0–1.9 – the sign is only recognised or felt, 2.0–2.9 – weak intensity; 3.0–3.9 – moderate intensity; 4.0–4.9 – strong intensity; 5.0 – very strong intensity of the sign manifestation). The results were recorded in a tasting sheet. The obtained data were statistically processed and interpreted graphically in the form of a petal diagram (profilogram).

Determination of the main physical and chemical parameters of the studied samples of pasta products was carried out according to DSTU 7348:2013 (moisture, acidity).

The study of the effect of powdered food additives from wild berries on the nutritional and biological value of pasta products was carried out by determining the protein content according to DSTU ISO 5983:2003, fat – according to DSTU ISO 6492:2003. The content of carbohydrates was represented as the sum of reducing sugars (according to DSTU 4954:2008) and fibre (DSTU ISO 5498:2004).

The vitamin C content of the experimental samples (powdered food additives and pasta) was studied by high-performance liquid chromatography (HPLC) (Agilent Technologies 1200, UV-Vis Abs detector, detection at λ=240 and 300 nm, C18 column (Zorbax SB-C18 4.6×150 mm, 5 μm)).

Identification of the amino acid profile of pasta samples was carried out by ion-exchange column chromatography using an amino acid analyser 'BIOTRONIK' (Germany).

Determination of safety indicators consisted in determining the content of toxic elements according to DSTU 7670:2014, microbiological indicators according to DSTU 8446:2015, DSTU 8447:2015.

**Table 1 - Recipe of pasta products**

| Ingredient | Content, g(kg) per 100 g(kg) of flour | | | | | | |
|---|---|---|---|---|---|---|---|
| | Control sample | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 | Sample 6 |
| Flour | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Sea buckthorn berry powder | - | 7.7 | 16.7 | 27.3 | - | - | - |
| Mountain ash berry powder | - | - | - | - | 7.7 | 16.7 | 27.3 |
| Drinking water | 42.9 | 46.1 | 50.0 | 54.5 | 46.1 | 50.0 | 54.5 |
| Total | 142.9 | 153.8 | 166.7 | 181.8 | 153.8 | 166.7 | 181.8 |

Three-fold repeatability of the studies was used in the research. The obtained experimental data are presented in units of the international SI system. Mathematical and statistical processing of the obtained results was carried out on a computer using MS Excel 2016 software. The determined value of reliability of deviation (p) does not exceed 0.05, which indicates the value of the accuracy index (P) of the results is more than 0.95

## Results of the research and their discussion

At the first stage of the conducted research the expert group determined the effect of powdered food additives from wild berries on organoleptic indicators of pasta products. It was noted that the prepared raw samples of pasta products met the requirements for this type of product according to DSTU 7043:2020 (Fig. 1).

High-quality pasta products made from durum wheat are characterised by amber-yellow colour, clean surface, non-sticky texture, and resistance to cooking [15]. Today, pasta products of unusual colour, different from the traditional white/yellow, are gaining consumer popularity for preparing gourmet dishes. Consumers also associate dark colours with products with high fibre content [16].

The results of studies of sensory parameters of experimental samples of pasta products showed that the surface of the products is smooth with slight roughness; shape – corresponds to the type of product (long ribbon-shaped products formed into nests). The colour of pasta products is monotonous, with a tinge of vegetable powder from the products of processing wild berries, without traces of sifting. The taste and smell are specific, peculiar to the used powdered food additive from wild berries, without any extraneous taste and odour.


**Fig. 1. Appearance of pasta prototypes**

However, increasing the content of the powdered additive up to 15% (sample 3, sample 6) leads to deterioration of consistency (brittle and fragile products) and too strong odour and taste peculiar to the added powdered wild berry additive

Boiled samples of pasta products with powdered food additives from wild berries were evaluated for appearance, colour, taste, odour, hardness, and general acceptability. The results of the analysis are presented in the form of a profilogram (Fig. 2).

It was found that pasta products with powdered food additives from wild berries acquire a saturated colour, the characteristic colour of the additive and a slight taste of berries, which does not deteriorate the taste properties of the product. It should be noted that colour loss was detected after cooking – the products acquire lighter and less saturated yellow/brown colours. However, the diffusion of pigments into water is visually insignificant. The colour change is the result of degradation of some carotenoids during pasta processing.

The results show that the addition of powdered food additives from wild berries does not significantly affect the cooking properties of pasta products. Thus, the state of products of experimental samples after cooking is characterised by excellent shape retention, almost do not stick together and do not form lumps.

The results of organoleptic evaluation of pasta samples (Fig. 2) indicate that the rational content of powder additives from *Hippophae Rhamnoides L.* and *Sorbus Aucuparia* berries in the pasta formulation is 10% (sample 2, sample 5), as the quality of the above samples was recognised by tasters as 'high' compared to sample 3 and 6.

In the second stage of research, the effect of vegetable powders from derivatives of berry processing on the physico-chemical pasta products was determined. The results are presented in Table 2.

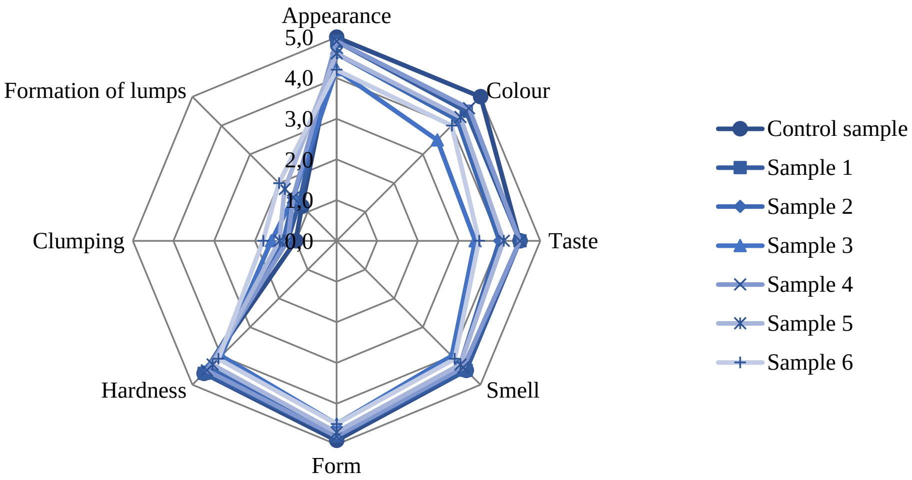


**Fig. 2. Sensory analysis of pasta samples after cooking**

**Table 2 - Physico-chemical parameters of experimental samples of pasta products**

(n=3, p≤0.05)

| Indicator | Sample | | | | | | |
|---|---|---|---|---|---|---|---|
| | control | 1 | 2 | 3 | 4 | 5 | 6 |
| Pasta products | | | | | | | |
| Moisture content, %. | 8.0±0.1 | 7.8±0.1 | 7.8±0.1 | 7.6±0.1 | 7.8±0.1 | 7.8±0.1 | 7.6±0.1 |
| Acidity, degrees | 4.0±0.1 | 4.5±0.1 | 6.5±0.1 | 9.0±0.1 | 4.5±0.1 | 5.5±0.1 | 7.5±0.1 |
| Mass fraction:<br>deformed products, %<br>crumbs, %. | <br>1.0±1.0<br>1.0±1.0 | <br>3.0±1.0<br>1.0±1.0 | <br>4.0±1.0<br>2.0±1.0 | <br>5.0±1.0<br>3.0±1.0 | <br>3.0±1.0<br>1.0±1.0 | <br>4.0±1.0<br>2.0±1.0 | <br>5.0±1.0<br>3.0±1.0 |
| Cooked pasta products | | | | | | | |
| Mass fraction:<br>protein, % | <br>5.4±0.1 | <br>5.1±0.1 | <br>4.6±0.1 | <br>4.2±0.1 | <br>5.2±0.1 | <br>4.8±0.1 | <br>4.4±0.1 |
| fat, % | 0.5±0.1 | 0.5±0.1 | 0.4±0.1 | 0.4±0.1 | 0.5±0.1 | 0.4±0.1 | 0.4±0.1 |
| of carbohydrates, %, *including*<br>fibre, % | 25.6±0.1<br>2.8±0.1 | 27.1±0.1<br>3.0±0.1 | 28.6±0.1<br>3.2±0.1 | <br>3.3±0.1 | 27.7±0.1<br>2.9±0.1 | 29.8±0.1<br>3.1±0.1 | 31.9±0.1<br>3.2±0.1 |
| Energy value, kcal | 123.4 | 127.9 | 130.7 | 135.2 | 130.6 | 136.1 | 142.4 |

Pasta products manufactured in laboratory conditions are characterised by satisfactory quality, but the moisture content of the products differs from the normative values (not more than 13%) and ranges from 7.6 to 7.8%. This is explained by the manufacturing conditions, which differ significantly from industrial ones – the use of three-stage type of drying (pre-drying, dehydration, final drying) in specialised equipment and cooling (stabilisation) of pasta products. However, the obtained results of moisture content of experimental products of pasta products within the permissible limits according to DSTU 7043:2020.

According to the results (Table 2), the studied samples of pasta products also differ in the acidity index of products, probably due to the increased acidity of powder additives from wild berries [17]. With increasing the concentration of powder additives in the pasta formulation from 5 to 15% (Table 1) increases the mass fraction of deformed products and their brittleness, but these indicators remain within the permissible limits for these products in accordance with DSTU 7043:2020.

The content of the main nutrients (proteins, fats, carbohydrates) in pasta samples was investigated (Table 2). The results showed that the increase in the mass fraction of powdered food additives from wild berries in the samples leads to a decrease in the content of protein and fat, while the content of fibre increases. This trend is explained by the chemical composition of powdered food additives from wild berries [17, 18] and the increase in their concentration in the pasta formulation (Table 1). The decrease in gluten proteins in the experimental samples makes it difficult to form a sufficiently strong protein matrix that binds and closes the starch granules. As a result, this can lead to lower culinary quality of pasta products, overcooking during cooking, lower hardness and elasticity of products after cooking.

It was also found that the developed pasta samples contained more fibre than the control samples (3.0–3.3% vs. 2.8%). Dietary fibre (fibre) plays an important role in retaining toxins in the intestinal tract, reducing cholesterol levels, inhibiting fat absorption, reducing the risk of cardiovascular disease and as a prebiotic for beneficial microbiota in the intestinal tract [19].

Vitamin C is an essential vitamin, which can only be obtained from food of plant origin. Vitamin C participates in metabolic processes and has antioxidant properties. It also takes part in the synthesis of hormones, which play an important role in the response of the cardiovascular system to severe infection and helps to absorb iron [20]. Therefore, enriching products with food additives containing vitamin C will increase their biological value. The results of the study of vitamin C content in experimental samples of pasta products with powdered food additives from wild berries (raw) are presented in Fig. 3.

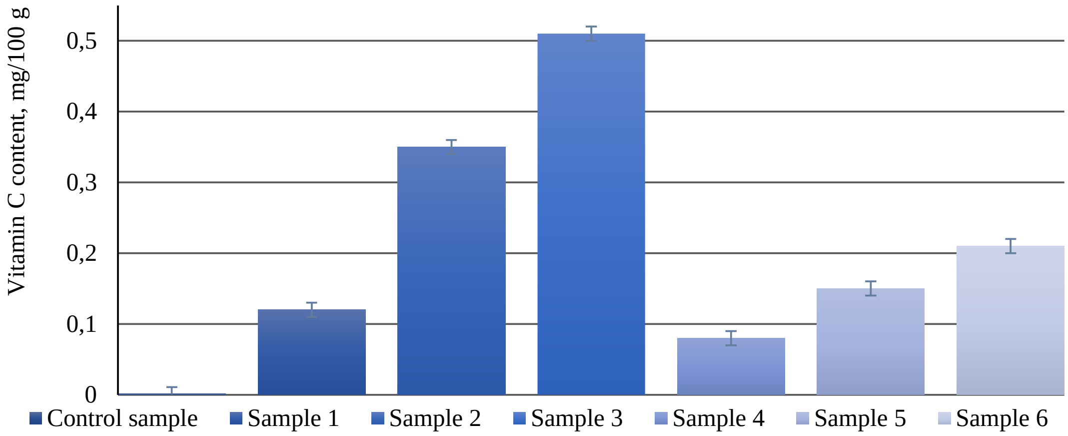


**Fig. 3. Vitamin C content in the test samples of pasta products**

The data presented in Fig. 3 demonstrates that with increasing concentration of powdered food additives from wild berry fruits the vitamin C content in the experimental samples of pasta products increases. The highest content of vitamin C is characterised by pasta samples with powders from *Hippophae rhamnoides L.* (samples 1–3), which is due to the high value of the vitamin in the plant additive [18].

Biological adequacy of proteins of powdered food additives [14, 18] determined the studies of amino acid profile of pasta samples. The chromatographic method identified 17 amino acid residues in the experimental samples of pasta products, presented in Fig. 4.

Application of plant powders from derivatives of *Hippophae Rhamnoides L.* berry processing in the amount of 10% (sample 2) and 15% (sample 3) increases the content of amino acids (Fig. 4), in particular essential, such as lysine (Lys) – by 16...29% compared to the control sample, threonine (Thr) – by 6...13%, valine (Val) - by 2...8%, isoleucine (Ile), leucine (Leu) and phenylalanine (Phe) – by 2...6%. And substitutes, such as asparagic acid (Asp) – by 30...49%, arginine (Arg) – by 22...36%, histidine (His) - by

10...19%, tyrosine (Tyr) – by 6...12%, alanine (Ala) – by 8...16%, glycine (Gly) – by 7...14%, serine (Ser) – by 5...12%.

The results obtained (Fig. 4) show that the addition of powders from *Sorbus Aucuparia* berry processing in the amount of 5% (sample 4) does not change the amino acid profile of pasta. However, the addition of *Sorbus Aucuparia* powder in the amount of 10% (sample 5) and 15% (sample 6) increases the concentration of the following amino acids lysine (Lys) – by 6...12% compared to the control sample, threonine (Thr) – by 5...12%, valine (Val), isoleucine (Ile), leucine (Leu) and phenylalanine (Phe) – by 1...6%, aspartic acid (Asp) – by 45...72%, histidine (His) – by 14...25%, glycine (Gly) – by 11...22%, tyrosine (Tyr) – by 7...14%, alanine (Ala) – by 5...12%, serine (Ser) – by 3...7%.

According to the above results, the feasibility of using powdered food additives from wild berry fruits in the formulation of pasta products in order to improve the amino acid profile of finished products was confirmed.

In order to produce safe products, experimental samples of pasta products were tested for safety indicators: the content of harmful microflora and toxic elements. The obtained results are presented in Table 3.

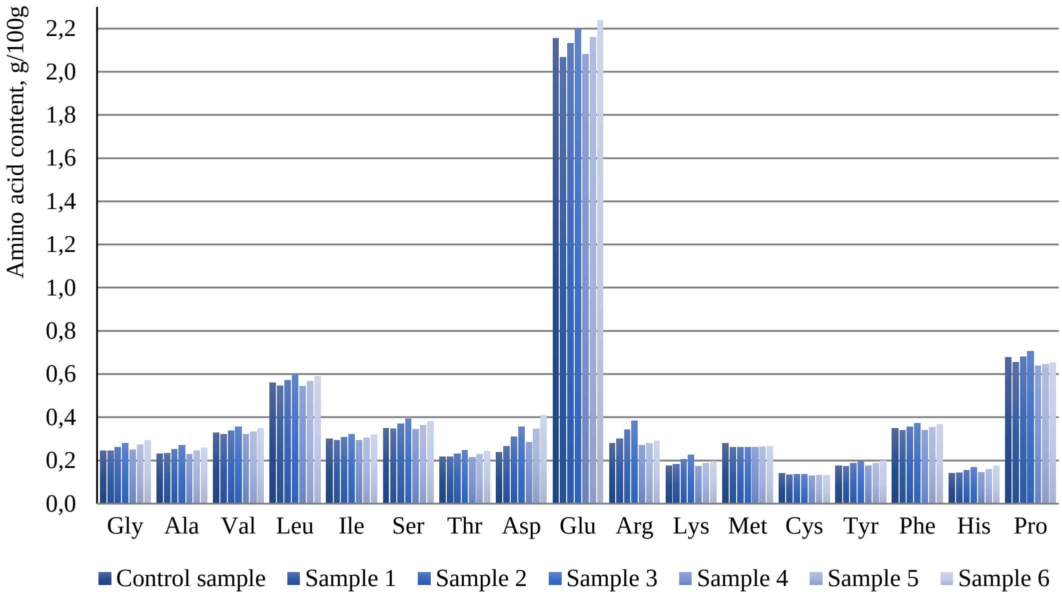


**Fig. 4. Amino acid profile of pasta samples**

**Table 3 - Safety indicators of the pasta prototypes**

(n=3, p≤0.05)

| Indicator | Sample | | | | | | |
|---|---|---|---|---|---|---|---|
| | control | 1 | 2 | 3 | 4 | 5 | 6 |
| Microbiological indicators: | | | | | | | |
| Number of mesophilic-aerobic and facultative-anaerobic microorganisms, CFU in 1.0 g | $2.41 \cdot 10^3$ | $3.12 \cdot 10^3$ | $3.18 \cdot 10^3$ | $3.20 \cdot 10^3$ | $2.80 \cdot 10^3$ | $2.85 \cdot 10^3$ | $2.91 \cdot 10^3$ |
| Escherichia coli bacteria (coliforms) in 0.1 g | undetected | | | | | | |
| Yeast, CFU in 1.0 g | undetected | | | | | | |
| Mould fungi, CFU in 1.0 g | undetected | | | | | | |
| Toxic elements: | | | | | | | |
| Lead, mg/kg | 0.04 ±0.001 | 0.084 ±0.001 | 0.09 ±0.001 | 0.095 ±0.001 | 0.086 ±0.001 | 0.091 ±0.001 | 0.097 ±0.001 |
| Cadmium, mg/kg | 0.006 ±0.001 | 0.007 ±0.001 | 0.007 ±0.001 | 0.008 ±0.001 | 0.006 ±0.001 | 0.007 ±0.001 | 0.007 ±0.001 |
| Copper, mg/kg | 0.91 ±0.01 | 1.94 ±0.01 | 1.99 ±0.01 | 2.03 ±0.01 | 1.52 ±0.01 | 1.69 ±0.01 | 1.78 ±0.01 |
| Zinc, mg/kg | 3.25 ±0.01 | 7.02 ±0.01 | 7.35 ±0.01 | 7.51 ±0.01 | 7.69 ±0.01 | 8.37 ±0.01 | 8.65 ±0.01 |

The study of microbiological indicators showed permissible values for this type of product. Also, the results of the study showed that the prototypes of pasta products are safe – the content of heavy metals is within the permissible limits for food products.

## Conclusion

Based on the results of the conducted complex experimental studies of the effect and proportions of powdered food additives from wild berries *Hippophae Rhamnoides L.* and *Sorbus Aucuparia* on organoleptic and physico-chemical parameters of pasta products, it is recommended that the concentration of powders in the formulation is 10%. This will provide sensory properties of dry and cooked pasta products – with a pleasant barely perceptible taste and aroma of the corresponding berries, with an attractive colour for consumers. Pasta products with berry powder 10% are characterised by satisfactory hardness and stability during cooking.

Addition of powdered food additives from wild berries in the formulation of pasta products in the amount of 10% allows to significantly improve the nutritional and biological value of finished products. In particular, samples of pasta with powder additives from *Hippophae Rhamnoides L.* contain 3.2% of fibre, vitamin C – 0.51 mg/100g. In samples of pasta products with powder additives from *Sorbus Aucuparia* the content of fibre is 3.1%, vitamin C – 0.15 mg/100g. It was also found that the introduction of powdered food additives from wild berries in the amount of 10% increases the content of amino acids, such as lysine, threonine, valine, isoleucine, leucine, phenylalanine, asparagic acid, arginine, histidine, tyrosine, alanine, glycine, serine.

The results of studies of the content of harmful microflora and toxic elements confirm the compliance of the developed pasta products with safety indicators in accordance with current standards.

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# ДОСЛІДЖЕННЯ ВПЛИВУ ПОРОШКОВИХ ХАРЧОВИХ ДОБАВОК ІЗ ДИКОРОСЛИХ ЯГІД НА ЯКІСТЬ МАКАРОННИХ ВИРОБІВ

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**Анотація.** Метою даного дослідження є визначення впливу порошкових харчових добавок із дикорослих ягід *Hippophae Rhamnoides L.* та *Sorbus Aucuparia* на якість макаронних виробів. Макаронні вироби були виготовлені із борошна твердих сортів пшениці з додаванням порошків із плодів обліпихи та горобини в кількості 5%, 10% і 15%. В статті проаналізовано органолептичні та фізико-хімічні показники, вміст клітковини, вітаміну С та амінокислотний профіль дослідних зразків макаронних виробів. Органолептична оцінка показала, що раціональною кількістю добавки є 10%. При цьому поверхня дослідних виробів була гладенькою, із незначною шорсткістю; форма – відповідає типу виробу (довгі стрічкоподібні вироби сформовані в гнізда). Колір макаронних виробів однотонний, з відтінком доданого рослинного порошку, без слідів непромісу. Смак і запах специфічний, властивий доданому рослинному порошку, без стороннього присмаку і запаху. Збільшення вмісту добавки до 15% призводить до погіршення якості макаронних виробів за рахунок збільшення крихкості та надто яскравому запаху і смаку, властивому доданого порошку ягід. В результаті досліджень вмісту основних нутрієнтів встановлено, що розроблені зразки макаронних виробів містять більше клітковини (3.2% в обліпихових та 3.1% в горобинових), ніж контрольні зразки. Результати дослідження показали, що із збільшенням концентрації ягідних порошків, вміст вітаміну С в дослідних зразках макаронних виробів збільшується до 0.51 мг/100г в обліпихових макаронних виробах, 0.15 мг/100 г – в горобинових. В дослідних зразках макаронних виробів ідентифіковано 17 амінокислотних залишків. Дослідження мікробіологічних показників та вмісту токсичних елементів показали допустимі значення для цього виду продукції. Виходячи з результатів проведених комплексних експериментальних досліджень, продемонстровано помітне збільшення харчової та біологічно цінності макаронних виробів із додаванням порошкових харчових добавок із дикорослих ягід. Рекомендована кількість доданих порошків в рецептурі макаронних виробів становить 10%. Це забезпечить прийнятні сенсорні властивості готових макаронних виробів. Також встановлено, що внесення рослинних порошків із похідних переробки дикорослих ягід в кількості 10% покращує амінокислотний профіль готових виробів.

**Ключові слова:** макаронні вироби, рослинна сировина, продукти переробки плодів, порошкові харчові добавки, клітковина.