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INCREASING THE QUANTITY OF PROTEIN IN COMPOUND FOOD BASED ON THE SECONDARY GRAIN, FRUIT RAW AND PROBIOTIC PREPARATIONS

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Annotation: The article describes a method for obtaining a protein feed additive for animal feed for industrial poultry breeding based on biotransformed secondary grain and fruit raw materials used for the synthesis of probiotic bacterial microflora. Recommendations have been developed for the production of a protein additive to animal feed and regime parameters of the process of biotransformation (bioconversion) of the raw material of the nutrient mixture, followed by the synthesis of bacterial microflora.

***Keywords*:** secondary vegetable raw materials, lactobacilli strain Laktobacillus fermentum No. 231, biotransformation (bioconversion), feed additive.

Currently, industrial poultry farming uses antibacterial drugs, which to a certain extent reduces the degree of food safety of products [1]. An alternative to antibiotics can be probiotic preparations based on biologically active natural strains of lactobacilli and bifidobacteria, which are the natural microflora of the gastrointestinal tract of animals [2, 3], so research in this direction is timely and relevant.

The purpose of the study was to develop a feed additive of increased protein value for poultry feed based on secondary grain and vegetable raw materials and probiotic microflora.

Wheat germ product (TU 9295-010-00932732-08 Food germ wheat flakes) and apple pomace powder (TU 10.61.23-843-37676459-2018 Powder from fruit and vegetable raw materials) were used as ingredients of the nutrient substrate for the accumulation of microbial biomass. ”), for fermentation - biologically active additive "Laktonorm-H" (O'z DSt ISO 9001:2015; ISO 9001:2015) produced by Sog'lomlik nektari LLC of the Republic of Uzbekistan.

Wheat germ product (hereinafter referred to as WPP) consists of 60…65% of germs and 35…40% of endosperm, flour and wheat bran fractions. Research conducted by N.R. Juraeva and others [4; 5,6,7], it was found that in this product, obtained at the mills of Uzbekistan, protein and fat are on average, respectively, 2.4 and 7.8, iron - 4.0 and 2.0 and vitamins 8 .0 and 7.0 times more than in wheat flour of the first grade, an increased amount of fiber. Sucrose and raffinose predominate among carbohydrates. The biological value of this product (76.4%) exceeds that of the reference protein according to FAO/WHO (44.0%) by an average of 1.7 times. Bran, which is one of the FDD fractions, contains insoluble prebiotics - cellulose, hemicellulose and lignins, which also improves the nutritional value of feed [8]. In terms of toxicological and microbiological indicators, this object of study complied with the requirements of SanPiN No. 0366-19 and O'z DSt ISO 6635:2013.

Apple pomace powder (hereinafter referred to as AP) was used as a nutrient medium enricher, the content of glucose and fructose in the amount of 11.2–36.8% contributes to its efficient and rapid assimilation by microorganisms. The presence in apples of pectin, galactooligosaccharides and fructozooligosaccharides, belonging to the group of soluble prebiotics, also helps to stimulate the growth of microorganisms. The protein content is 3.2 ... 3.8% DM, essential amino acids - 32.8% of

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the total amino acids. Of particular note is the increased amount of tryptophan in this raw material (AKC 400 ... 490%), which is necessary to maintain the growth of any organism. Ca, P, K, Fe, etc. are identified among mineral substances (1.36…2.84% DM). Among organic acids (1.02…7.5%), succinic, malic, and citric acids dominate [9].

A sociological survey of the main producers of juices and canned food from fruit, berries and vegetables practically do not use pomace obtained in their production, but supply it to nearby livestock farms, poultry farms and farms for a nominal fee, which basically covers only transportation costs. Respondents are very interested in more efficient use of this raw material, in particular, in the production of feed for farm animals and poultry, which will significantly increase the profitability of products and expand the possibilities for diversifying production.

Taking into account the need for complex processing of food raw materials, the identification of new sources of biologically active substances from the secondary resources of the food industry is of undoubted interest.

The choice of the drug "Laktonorm-N", containing lactobacilli of the strain Laktobacillus fermentum No. 231, is due to the fact that these bacteria are most adapted to both the human body and the body of animals and birds. The use of ready-made pharmacological preparations fully guarantees the purity of the culture, eliminates the need to purchase special pure cultures of lactic acid bacteria, as well as complex procedures to maintain their viability, which is especially important for regions and farms remote from the center. In addition, fodder yeast is not produced in Uzbekistan, and the strategic development policy of the republic is aimed at the rational use of local raw materials and reducing import dependence. This drug is produced in Uzbekistan at Sog'lomlik nektari LLC and is freely available in the pharmacy network. Temperature optimum growth 35-40°C, pH 5.0-6.0.

The quality indicators of the nutrient substrate and the number of microorganisms, their specific growth rate were determined according to standard methods described in profiling literature sources and the corresponding GOSTs.

Breeding of the bacterial population was carried out following the example of the preparation of liquid yeast at bakery enterprises, that is, with the preparation of a nutrient medium (brewing) and breeding of bacteria.

The prototype (comparison sample) was tea leaves prepared according to traditional technology, from wheat flour of the second grade and rye wallpaper in a ratio of 7:3.

To prepare a prebiotic nutrient medium in the experimental variants, the flour was replaced with a mixture of FDD and YP in a ratio of 9:1. Previously, this raw material was additionally dried and ground to the size of dietary flour (the passage of sieve No. 38 was not less than 60.0%). Next, the finished mixture was mixed with water (temperature 45...50°C) in a ratio of 1:4, which was then heated to a temperature of 67...70°C (starch gelatinization temperature). Sprouted quinoa grain was added to the tea leaves saccharified and cooled to a temperature of 45–50°C in a ratio of 10:1 relative to the mass of dry ingredients and left for 3 hours for the hydrolysis of high-polymer compounds of the raw material. A bacterial preparation was added to the prepared nutrient medium in the amount of 1 dose (not less than 10 106 bacteria) per 1.0 kg of tea leaves. A similar amount of this drug was added to the control starter (prototype).

The cultivation of bacterial microflora was carried out in a constant volume of the nutrient medium (without renewal) for 9 hours with constant stirring (every hour) to aerate the medium at a temperature of 35–40°C, which is optimal for the reproduction and growth of lactobacilli Laktobacillus fermentum No. 231. The growth of the microbial population was determined every hour of cultivation.

The results of the study are presented in Figure 1 and in the table.

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The analysis of the obtained results (Fig. 1) showed that both in the control and in the experimental samples of the culture mixture, the duration of adaptation of lactobacilli of the strain Laktobacillus fermentum No. 231 to the studied nutrient substrate (lag phase) naturally continued during the first 2 hours. During this time, the biomass of bacteria increased by an average of 1.3 (control) and 1.4 (experiment) times. Then, as expected, a sharp growth (exponential growth phase) of microorganisms was established, which lasted almost up to 8 hours from the start of cultivation.

The increase in biomass over this period increased in the control variant by 7.2, experimental - 7.7 times. The productivity of lactobacilli in the final control variant was 4.8, in the experimental variant - 5.4 billion cells / ml.

Further, cell growth practically stopped and the so-called stationary phase began, so further cultivation is not advisable, as clearly evidenced by the data presented in Figure 2.

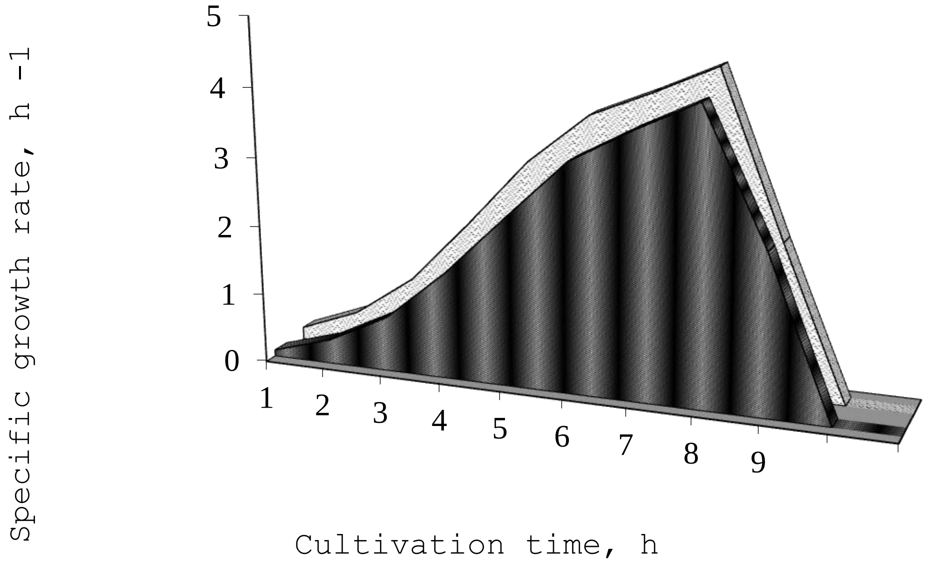

Figure 1 - Influence of the composition of the nutrient medium and duration cultivation on the specific growth rate of the bacterial population

A more intensive growth of the biomass of lactobacilli in the experimental variant is due to the increased content of reducing substances in the substrate and, most importantly, amine nitrogen (table).

Influence of prescription composition on biotechnological indicators of the quality of the nutrient medium for the synthesis of a bacterial population

Indicators	Meaning of indicators	
	Control (prototype)	Experience
Humidity,%	78,80	79,20
Acidity, hail	13,70	14,00
Mass fraction of reducing substances, % DM	8,15	8,62
Mass fraction of nitrogen, % DM:		
general	2,68	3,02
water soluble	1,25	1,58
amine	31,45	38,12
Specific growth rate of bacteria, h-1	0,16	0,30
Generation duration, h	4,33	2,31

In the experimental variant, an increase in the final acidity by an average of 0.3 degrees was noted; the mass fraction of reducing substances - by 5.8, total nitrogen - by 12.7, water-soluble - by 26.4 and amine nitrogen - 21.2% relative to the control values, which naturally affected the activity of bacteria. Thus, the specific population growth rate in the experimental variant was almost 2 times higher, and the generation time (the time required to double the biomass) of microorganisms was 2 times less than in the control.

The data obtained convincingly prove the technological effectiveness of the use of the studied raw materials subjected to biotransformation (bioconversion) and microbial synthesis to obtain feed additives enriched with protein of plant and microbial origin.

It is advisable to store this biomass in a dried form. However, this requires appropriate drying equipment, preferably with vacuum drying, which complicates the process and increases the cost of the finished product. Therefore, it is most expedient to mix raw biomass (moisture content 65.0...70.0%) with the rest of the prescription ingredients immediately after 7...8 hours of cultivation of the bacterial population.

- Other types and strains of bacteria and yeasts, especially those belonging to the natural microflora of animals, can also be used as the microbial population of these additives.
- Based on the results of the studies conducted on the study of the process of bioconversion of secondary grain (SGR), fruit (JV) and germinated quinoa grains, the following recommendations for its production were formulated:
- as a nutrient medium for the synthesis of microflora to use secondary raw materials of the grain processing, oil and fat and canning industries of the food industry;
- as a producer of microbiological protein – lactobacilli or bifidobacteria, yeasts are the most technologically efficient strains that give a consistently high biomass growth;
- particle size of the main raw materials of the nutrient medium should correspond to the size of dietary wheat flour;
- to obtain the required amount of protein supplement without additional costs for the purchase of bacterial preparations or yeast, it is advisable to renew the mixture at certain intervals (depending on the need), adding a nutrient substrate in a ratio of 1:1, so you can bring the culture mixture to the required volume;
- no additional or special equipment is required to prepare the culture mixture. However, it should be noted that in the process of cultivating microorganisms, aeration or mixing of the mass is necessary at certain intervals (preferably hourly).

The corresponding operating parameters of the process have been developed:

- initial humidity of the nutrient medium - 60.0 ... 65.0%;
- the duration of cultivation of the bacterial (yeast) population - no more than 8 hours;
- temperature of the culture medium - 35…40°C;
- The thickness of the substrate layer is 25…30 mm.

It should also be noted that the resulting feed product has a high protein content, similar in its amino acid composition to proteins of animal origin, is characterized by probiotic and prebiotic properties and can be recommended in the production of animal feed instead of scarce, expensive, traditional raw materials of animal origin, namely: fish meal, meat meal, and soybean meal, as well as to reduce the amount of antibiotics.

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