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INVESTIGATION OF THE UTILIZATION PROCESS OF SOYBEAN GRAIN WASTE IN THE PREPARATION OF FISH FEED FOR INTENSIVE FISH FARMS

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Abstract: The article presents the results of research on the technology of preparing enriched fish feed for young fish from soybean meal, a by-product of the soy milk production process. In our country, much attention is paid to expanding the scale of cultivation of non-traditional crops, including the expansion of soybean cultivation in the country since 2017. After all, more than four hundred types of products are produced from soybean grain and protein, which are used in all sectors of the national economy.

Key words: Soybean, soy milk, okara, protein, fat, carbohydrate, vitamin, fish feed

ИССЛЕДОВАНИЕ ПРОЦЕССА УТИЛИЗАЦИИ ОТХОДОВ СОЕВОГО ЗЕРНА ПРИ ПРИГОТОВЛЕНИИ КОРМОВ ДЛЯ РЫБОВОДЧЕСКИХ ХОЗЯЙСТВ ИНТЕНСИВНОГО ТИПА.

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Аннотация. В статье представлены результаты исследований по технологии приготовления обогащенного рыбного корма для молоди рыб из соевого шрота — побочного продукта процесса получения соевого молока. В нашей стране уделяется большое внимание расширению масштабов возделывания нетрадиционных культур, в том числе с 2017 года в стране расширяется возделывание сои. Ведь из соевого зерна и белка производится более четырехсот наименований продукции, которая используется во всех отраслях народного хозяйства.

Ключевые слова. Соя, соевое молоко, окара, белок, жир, углевод, витамин, корм для рыб

In our country, great attention is being paid to expanding the scale of cultivation of non-traditional crops, including the expansion of soybean cultivation in the country since 2017. After

all, more than four hundred products are made from soybean grain and protein, and they are used in all sectors of the national economy.

Currently, the United States is the world's largest producer of soybeans (40% of the total cultivated area and 50% of the harvested crop), Brazil is the second largest (approximately 19% of the cultivated area and 19% of the harvested crop), China is the third largest (approximately 13% of the cultivated land and 8.5% of the harvested crop), and Argentina is fourth (10% of the cultivated land and 10% of the harvested crop). 11 percent), the fifth place is taken by India (9 percent of the cultivated land and 3.4 percent of the harvest). The countries of the European Union have allocated 1.5% of the world's cultivated land to the cultivation of soybeans, and 1% of the crop is harvested.

The variety of coloring pigments in different parts of the soybean seed gives soybeans their different colors. All of these pigments have a very complex structure and undergo chemical changes during the oil extraction process. The rate of color change depends on a number of factors, primarily temperature. Changes in temperature not only affect the solubility of colorants in the oil, but also the degree of their change and lead to a significant change in the color of the oil.

Modern soybean processing involves extracting oil from soybean seeds using a solvent extraction method and then processing it. The remaining protein meal is of high quality and is used for food and feed. It is also used in the production of soy protein and dietary fiber. The husk contains cellulose, hemicellulose, fiber, zinc, and iron.

In our country, soybeans are mainly used to obtain soybean oil, but soybeans are distinguished from other crops by their very high protein content (36-50%), which makes them a very valuable crop. They contain enzymes, organic acids, vitamins, pigments and other substances. The protein content of soybeans is a valuable food and feed product. Therefore, it is advisable to use soybeans as a source of protein in the food industry.

we aimed to use soybean meal, a by-product of the soy milk production process for use in the production of beverages and food products, in the preparation of fish feed for intensive fish farms.

There are several methods and technologies for obtaining soy milk. Each method has its own characteristics, affecting the chemical composition and organoleptic characteristics of the obtained milk. All methods of milk extraction include grinding, filtering, boiling and cooling processes, and the processes of coagulation, bleaching and treatment with reagents are used depending on the type of method. These processes serve to improve the quality of the product and reduce the time. In our research, the processes of obtaining soy milk and the use of secondary products were studied.

To obtain soy milk from local soybeans using the traditional method, first, based on information obtained from the literature, 1 kilogram of local soybeans was soaked in one liter of warm water for 7 hours. 5 liters of distilled water was poured over the soaked soybeans and heat treated at 90-100°C for 10 minutes. Then, the finished soybean mass was ground using a blender. As a result, a mushy mass was formed. That is, the proteins in the soybeans were extracted into water. Soy milk was squeezed out of the resulting mass using a special cloth bag. As a result, 4 liters of soy milk and 2 kilograms of okara were obtained. In the next stage of our research, we conducted a compositional analysis of the obtained soy okara. The results of the study were as follows. (Table 1)

Table 1

The chemical composition of soy okara obtained in the experimental results

Name of indicators, units of measurement	Test results
Mass fraction of fat, %	3.5
Mass fraction of protein , %	5.95
Mass percentage of moisture and volatile substances ,%,	79.05
Carbohydrate mass percentage , %	10.85
Mass fraction of ash , %	0.55
Vitamin B_1 mg	0.90
Vitamin B_2 mg	0.21
Vitamin B_4 mcg	259
Vitamin B_5 mg	1.68
Vitamin B_6 mg	0.80
Vitamin B_9 mcg	195

it is appropriate to use this product as an enrichment agent in various industries . In many countries, soy okara is widely used in the preparation of food products, especially as an enrichment for confectionery products.

In our research, we set ourselves the goal of enriching the composition of fish feed prepared from soybean meal for intensive fish farms with soybean meal.

During our experiments, a recipe for fish feed prepared by adding soy okara was created (Table 2).

(Table 2)

RECIPE

(for 100 kg product)

Raw material name	Quantity (kg)
Fish oil	30
Soy sauce	25
Wheat bran	15
Corn flour	10
Fish oil	5
Vitamin and mineral premix	1
A mixture of salt and phosphorus	0.5
Binder (starch, gelatin, KMTs)	3.5
Water	10

At the next stage of our experiments, soft feed was prepared based on the recipe . The process of food preparation was carried out in the following steps.

TECHNOLOGICAL SCHEME OF FISH FEED PREPARATION

Grinding raw materials

↓

dry mixing

↓

wet mixing

↓

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granulation

↓

drying

First raw materials a wet grinding process was carried out, in which flour, bran and okara products were ground until the particle size reached a uniform size and reduced to a powder state . Then, mineral and vitamin additives were mixed into the finished powder mass in the amount specified in the recipe, i.e. dry mixing. done. The next step is wet mixing The process was carried out, in which fish oil, binders and water were added to form a homogeneous mass. The prepared wet mass was given a shape, that is, the granulation process was carried out. The fish feed in the form of granules was dried in special drying cabinets.

In conclusion, we can say that during our research work, by using soybean waste in the preparation of fish feed, we achieved enrichment of the feed composition with high-quality protein, fat, carbohydrate, vitamins and minerals. Since the main part of the prepared fish feed is secondary products, it is almost twice cheaper than imported products in terms of cost, and as a result of the research, we achieved the production of an import-substituting, competitive product with high economic efficiency, high nutritional value.

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