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DEVELOPMENT OF TECHNOLOGY FOR THE PRODUCTION OF MULTICOMPONENT FEED SUPPLEMENT

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ABSTRACT

This article presents the results of the development of a new highly effective feed additive based on the use of secondary fractions in the production of a substitute for whole milk. The resulting additive is characterized by high calcium content (10.8 times), as well as a content of β-carotene for 2 mg/100g of the product, which provides it with high biological and nutritional value, as well as antioxidant activity. The developed technology for energy intensity is more than 3 times lower than the base one recommended for small and medium capacity farms. The implementation of the developed technology, as well as the set of equipment adopted for it, makes it possible to increase the efficiency of the functioning of the mechanized system of feeding animals on small and medium-sized farms by reducing the cost of energy, labor, and money.

Disciplinary: Animal Sciences (Animal Nutrition and Feed Technology).

1. INTRODUCTION

An analysis of the data characterizing the condition of the feed base at small and medium-sized enterprises for the production of livestock and poultry products shows that currently there is a shortage of protein, vitamins, macro and micronutrients in feed rations. So, in particular, the use of low-fat soybean meal does not allow to have vitamin E in the diets, and the absence of a root component in the diets, in the form of pumpkin or carrot - β–carotene (Tutelian, 2004, Dotsenko et al., 2020).

When developing substitutes for milk-containing feeds, still few include vegetable protein and vitamin substances, and in particular, soy, root, vegetable, and others. Low energy-intensive technologies and technical means for extracting proteins and vitamins from soy grain and root crops

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have not been developed. Today, neither small nor medium producers have special small-sized modular-block technology for these purposes (Tutelian, 2005).

Protein-vitamin supplements, protein-vitamin calcium supplements, and others are homogeneous mixtures of high-protein fodder products and micro additives, crushed to the required size, used for the preparation of animal feed based on grain fodder.

Obtaining soy protein feed products of high nutritional and biological value is a promising direction in the development of complete feeds. Get fodder products from soy flour and carrot, or beetroot, or pumpkin pastes or their compositions, or their combinations based on the principle of averaging dry matter content under mild conditions and a shorter cooking time with a higher protein and fat content, the presence of biologically active substances in them - carotene and vitamins C and R (Kochetkova, 1999).

At the same time, non-fat-free flour is prepared on the basis of soybean seeds, which contains vitamin E and more than 40% protein, balanced for essential amino acids.

In this regard, obtaining protein-vitamin products based on these raw materials, for example, in granular physical form, is an urgent task.

Deficiency of proteins and calcium can be eliminated in diets by using meat or fishmeal meals, but the cost of their production is very high (Petibskaya, 2012).

A theoretical approach to achieving the goal is that upon receipt of soy protein feed products, including mixing, molding and heat treatment of a mixture of soy protein and carbohydrate-vitamin components, soy protein-free flour containing dry matter 88-92 is used as a soy protein component %, and carbohydrate and vitamin - carrot, beetroot or pumpkin paste or their composition, or combinations thereof with a solids content of 8-12% (Dotsenko et al., 2018).

At the same time, the production technology of so-called “soy milk” based on soy-pumpkin or soy-carrot compositions, a waste fraction in which soy-pumpkin or soy-carrot pulp residue is known (Dotsenko, et al, 2016).

Using this waste product in combination with chalk in powder form, you can get granular feed protein-vitamin-calcium supplement (Ostroumov, 1998).

This study develops a technological scheme for producing protein-vitamin-calcium supplements and justifies the technology using soya-pumpkin and soya-carrot pulp residue in the technology for producing granular protein-vitamin-calcium supplements with less labor and money.

2. MATERIALS AND METHODS

Studies have established that pulp obtained as a waste in the production of soya-pumpkin or soya-carrot product in the form of a substitute for whole milk contains 60-70% water, δ = 10% protein, β-carotene on average up to 10 mg/kg, however, it has a limited shelf life [1, 2].

According to the proposed technology (Figure 1), on the basis of pre-soaked soybean seeds and crushed root crops (carrots and pumpkins), with the help of a grinder-extractor -1 (Figure 2), so-called "soy milk" and the waste fraction - insoluble soybean - are obtained pulp root crop, in which in a weight ratio of 1: 1, is mixed with chalk, transformed into flour form using a mixer -3. At the same time, chalk is fed from the feeder - 2.

The moisture content due to its diffuse transition into the chalk component of the composition.

A composition with average humidity is formed into granules with a diameter of 2-3 mm using a screw - 4 and a matrix - 5. The granules are accumulated in a mesh tray - 6 and dried in a cabinet - 7 with active ventilation.

3. RESULT AND DISCUSSION

The energy intensity of traditional and innovative technologies is determined by the formula.

$$E = \frac{100 \times N}{Q_l \times P_r} \quad (1)$$

where N – energy consumption for producing granulate, kW;

Q_l – line productivity kg/h;

P_r – pellet strength, %.

The installed power of electric motors in the set of equipment K_7 - FKE is N_t = 254.5 kW, with a pellet strength of P_r = 93% and a productivity of Q_l = 100 kg / h, which gives an indicator value $E_t = \frac{100 \times 254.5}{100 \times 93} = 2.736 \frac{kWh}{kg\%}$.

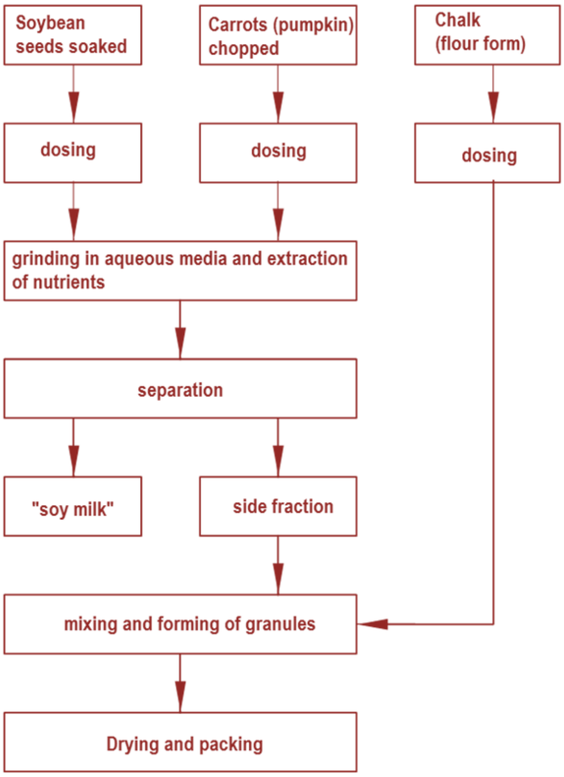

Figure 1: The technological scheme of the process of obtaining feed products based on soy-pumpkin and soy-carrot compositions.

For an innovative technology variant, E_i is $E_i = \frac{100 \times 83.4}{100 \times 95} = 0.877 \frac{kWh}{kg\%}$.

Comparative characteristics of the energy intensity of production and nutritional value of feed additives are given in Table 1. An analysis of the data given in Table 1 shows that the energy intensity by innovative technology is 3.119 times lower compared to the basic version. Comparative characteristics of the energy intensity of production and nutritional value of additives.

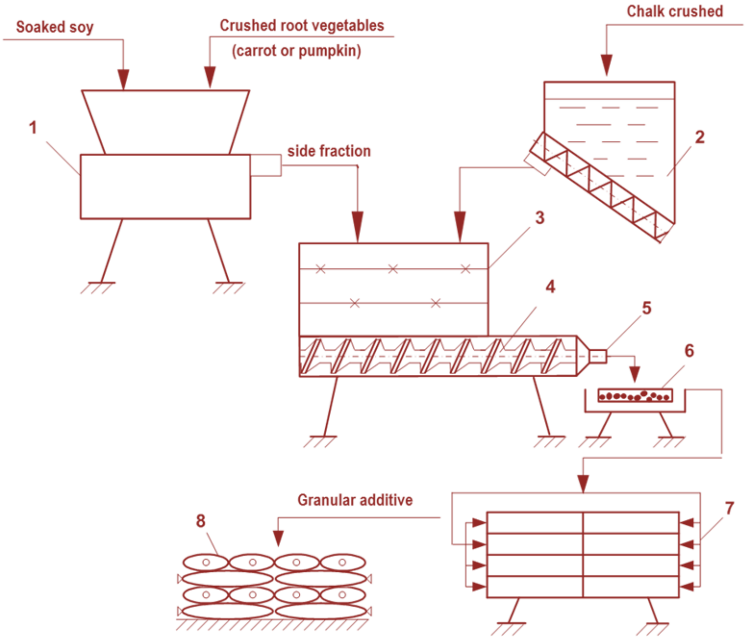

Figure 2: Structural-technological (hardware) scheme of the line for producing karate-calcium additives for farm animals and poultry.

Table 1: The results of evaluating the effectiveness of the developed technology

Product	Electricity costs, $\frac{kWh}{kg\%}$	Content		Strength, %
		Calcium, g/100 g	β-carotene mg/kg	
The product according to a known method (K_7 - FKE)	2,736	1,8	-	93,0
Protein-carotene-calcium supplement	0,877	19,5	2,0	95,0

Moreover, in an innovative product, the calcium content is 10.8 times higher. At the same time, the presence of β-carotene in the additive in an amount of 2 mg / 100 g provides it with high biological and nutritional value, as well as antioxidant activity.

The developed non-waste technology, with the specified values of the modes and parameters, allows obtaining granules with a diameter of 2-3 mm and a length of 2-3 cm (see Figure 3). The strength of the granules was 93-95% and moisture content 92%.

Figure 3: Multicomponent feed supplement.

4. CONCLUSION

Based on the adopted innovative approaches, the possibility and feasibility of obtaining an effective additive using soya-pumpkin and soya-carrot pulp residue, which is a waste fraction in the production of a substitute for whole milk using soya-pumpkin and soya-carrot compositions, are substantiated.

The implementation of the developed technology, as well as the set of equipment adopted for it, makes it possible to increase the efficiency of the functioning of the mechanized system of feeding animals on small and medium-sized farms by reducing the cost of energy, labor, and money.

5. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding authors

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