Feed Additives Production Out of Dairy Industry Waste

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Abstract. Application of macro- and microelements in animal feed is the most effective in the case of their industrial brining in mixed feeds, feed mixes, and protein-vitamin supplements in the form of various complex salts. Application of the product contributes to the body's needs of broiler chickens in vitamins and minerals, normalization of metabolism, and ensures a high rate of growth and development. The composition of the premix can be adjusted depending on the actual proportion of biologically active substances in the feed used by a consumer. It is possible to include in the premix other biologically active substances. Assessing the slaughter qualities of experimental pigs, it was found (Table 2) that the pigs of group II has a tendency toward greater weight of hot carcass (4.5 kg), of slaughter yelts (by 3.83%) and toward a smaller thickness of fat over the spinous processes of the 6-7th thoracic vertebrae (1.67 mm).

The performed investigations have established that there is no significant difference between groups I and II in the content of certain amino acids, however, group I shows poorer results in the content of valine, isoleucine, leucine and lysine by 0.16 g / 100 g of protein (P> 0.999) 0.2 (P> 0.90), 0.46 (P> 0.999) and 0.39 (P> 0.999) g / 100 g protein respectively.

1. Introduction
Toxicity of feed and feed additives is determined by their ability to have an adverse effect on an animal organism [1].

Unfortunately, feed poisoning still cause significant economic damage to the national economy (death of animals, loss of their productivity). This damage is aggravated by poisoning people who consume milk, meat and eggs produced by these animals. The more significant the damage is, the fewer breeders know about these issues, so they mix toxicosis with other non-communicable or contagious animal diseases. As a result of such incorrect actions the diseases are not eliminated but, on the contrary, are promoted to be spread. [2]

Feed poisoning can be caused by some poisonous plants, poisonous seeds, feed means that clearly obtain toxic properties if they are used incorrectly, as well as animal feed contaminated with certain agrochemicals. In addition, poisoning can occur in the case of using food, affected by fungi and other macro- and micro-organisms [3].

At the first glance the major number of poisoning is harmless and caused by feed additives used incorrectly. This is poisoning with sodium chloride, salts of copper, molybdenum, selenium and fluoride, salts of heavy metals, which often contaminate feed additives of mineral origin, and many feeds of industrial origin.
The following premixes are distinguished: vitamin, mineral, vitamin-therapeutic, vitamin and mineral premixes and others [5].

One of the conditions for obtaining low-cost high-quality products is to use minerals and biologically active substances in animal feeding rations balanced on a large number of nutrients. At the same time a special attention is paid to premixes, mineral and vitamin mixtures [6].

Every year practice of animal feed significantly expands the scope of various feed additives and premixes in particular, mineral and vitamin mixtures. Vitamins and minerals perform a variety of functions, participate in the biosynthesis and maintain animal vital activity. Highly productive animals often experience lack of calcium, phosphorus, magnesium, sodium, sulfur, iron, copper, zinc, manganese, cobalt, iodine, selenium, and vitamin A, D, E, K and group B [7].

Premixes are used for the production of protein-vitamin-mineral supplements (PVMS) and for guaranteed enrichment of mixed fodders, feed mixtures. Following special recipes premixes are produced for all kinds of animals and then marked with alphabetic letters in accordance with the prescription code. The premix recipe is a set of biologically active substances (BAS) and filler, expressed in mass proportion of the individual components in the final mixture.

Premixes contribute to the prevention of diseases associated with a lack of vitamins and minerals. They increase the digestibility of feed nutrients; improve the nutritional and technological value of milk, meat, eggs, fell quality of fur-bearing animals; harden strength of bones and eggs shell [8].

The Russian Federation mainly produces 1% vitamin and mineral premixes with stabilized (protected) forms of vitamins and enzymes. Premixes with increased concentration (0.2-0.5%) should be produced as vitamin concentrates without bringing micronutrient salts. Contact between vitamins does not lead to negative consequences (except for the contact of choline-chloride with vitamins A, B1, B6, K and C, because it can lead to a decrease in vitamins activity). [9]

Application of macro- and microelements in animal feed is the most effective in the case of their industrial brining in mixed feeds, feed mixes, and protein-vitamin supplements in the form of various complex salts [10].

Biological properties of the premix are specified with the presence of vitamins and minerals in its composition in the optimum ratio. Application of the product contributes to the body's needs of broiler chickens in vitamins and minerals, normalization of metabolism, and ensures a high rate of growth and development. The approximate composition of the premix for broiler chickens is shown in Table 1.

The composition of the premix can be adjusted depending on the actual proportion of biologically active substances in the feed used by a consumer. It is possible to include in the premix other biologically active substances (enzymes, amino acids, flavorings, digestion intensifier, chelate compounds of microelements, coccidiostatics, etc.).

The intensity of swine breeding depends largely on full animal feed. To make up for nutritional deficiencies in pigs diet it is used different supplements, including premixes.

There were experimental groups to study ethological reactions of pigs: quantitative in fighting, its duration, duration of free time, feed intake by the procedure of V.I. Velizhanina (1979) with calculations of the index of functional activity (IFA).

When yelt reached 105 kg in weight, it was slaughtered for assessment of slaughter (meat) qualities. 24 hours later after a slaughter (post-mortem ageing) the tests were taken out of 10 carcasses of pigs in group I and 10 – group II of muscle (rib eye) and fat (subcutaneous fat) tissues at a level between the 9th and 12th thoracic vertebrae to study pork quality.
Table 1 – The content of micro- and macro-elements per 1 k1 of premix

|                | broiler chickens S (1-4 weeks) | broiler chickens G (≥ 5 weeks) |
|----------------|---------------------------------|---------------------------------|
| vitamin A      | 2 400 000 IU                    | 2 000 000 IU                    |
| vitamin D3     | 700 000 IU                      | 650 000 IU                      |
| vitamin E      | 25 g                            | 15 g                            |
| vitamin B1     | 600 mg                          | 600 mg                          |
| vitamin B2     | 1.5 g                           | 1 g                             |
| vitamin B6     | 500 mg                          | 500 mg                          |
| vitamin B12    | 5 mg                            | 5 mg                            |
| vitamin K3     | 600 mg                          | 600 mg                          |
| vitamin H (biotin) | 20 mg                        | 20 mg                           |
| nicotinic acid (B5) | 6 g                           | 6 g                             |
| Pantothenic acid (B3) | 3 g                           | 2 g                             |
| Folic acid (Bc) | 150 mg                          | 140 mg                          |
| choline chloride | 60 g                           | 60 g                            |
| vitamin C      | 10 g                            | 10 g                            |
| manganese      | 20 g                            | 20 g                            |
| cobalt         | 200 mg                          | 200 mg                          |
| copper         | 2 g                             | 0.6 g                           |
| zinc           | 12 g                            | 12 g                            |
| iodine         | 400 mg                          | 300 mg                          |
| iron           | 6 g                             | 6 g                             |
| selenium       | 60 mg                           | 60 mg                           |
| Natuphos       | 20 g                            | 20 g                            |
| enzyme         | +                               | +                               |
| (on request)   | +                               | +                               |
| antioxidant    | +                               | +                               |

2. Equipment and devices used in studies
The content of amino acids was determined with an amino acid analyzer LC 5700 produced by "Eppendorf-Biotonis" (Germany). For the separation of amino acids it used a standard buffer system. Solutions before introduction into the analyzer were filtered through a Teflon filter with a pore size of 0.22 microns. The work of the analyzer was performed on the standard hydrolyzate program, which includes a stepwise change of the buffer mode and of the chromatographic column temperature in each stage. Standard analysis time from sample introduction to the moment of peak output of arginine took 50 minutes. While the flow rate of eluent was 0.22 ml / min.

The results were biometrically processed by according to standard procedures on a PC using the Excel program.

Considering the dynamics of the linear measurements, it was found that a 2-months. age piglets of group II compared to group I had an advantage in high withers - 19.3%; width - 12.45% (P> 0.99) and chest girth behind the shoulders -16.56%, metacarpus - 16.68% (P> 0.95).

3. Results and discussion
Feeding qualities of studied yelts are shown in in Table 2.
Assessing the slaughter qualities of experimental pigs, it was found (Table 2) that the pigs of group II has a tendency toward greater weight of hot carcass (4.5 kg), of slaughter yelts (by 3.83%) and toward a smaller thickness of fat over the spinous processes of the 6-7th thoracic vertebrae (1.67 mm).

The slaughter quality of studied yelts are presented in Table 3.

### Table 3 – Slaughter quality of studied yelts

| Quantity of yelts | yelts body weight before the slaughter, kg | weight of hot carcass, kg | slaughter yelts, % | thickness of fat over the spinous processes of the 6-7th thoracic vertebrae, mm | weight of back third of semicarcass, kg |
|------------------|------------------------------------------|--------------------------|-------------------|--------------------------------------------------------------------------------|-------------------------------------|
| I 10             | 105.46±3.0                              | 68.10±1.05               | 64.49             | 33.48 ±1.10                                                                   | 10.43±0.54                          |
| II 10            | 106.24±3.2                              | 72.58±2.56               | 68.32             | 31.81 ±0.94                                                                   | 11.35±0.69                          |

Based on the analysis of international experience and existing realities it is believed that the development of new and improvement of existing content and fattening animals technologies it is necessary to must take into account productivity and economic efficiency indexes of meat production, as well as quality indicators.

An important component of meat productivity is an assessment of pork quality. After carrying out evaluation of the physical and chemical properties of muscle tissue of the studied yelts (Table 3) it was determined that the animals of group I show higher pH level (by 0.152 acid. units), water binding capacity (by 3.76%), color intensity (by 2.98 units of extinction), fat proportion (2.1%), and less proportion of protein (0.86%) and lactic acid (at 50.1 mg%) comparing to group II. Physical and chemical properties of yelts muscle tissue are presented in Table 4.

### Table 4 – Physical and chemical properties of yelts muscle tissue

| № group | moisture, % | fat, % | protein, % | pH acid. unit. | nitrogen, mg% | lactic acid, mg% | water binding capacity, % | color intensity, units of extinction x 1000 |
|---------|-------------|-------|------------|----------------|---------------|-----------------|--------------------------|------------------------------------------|
| I       | 45.62±0.26  | 40.78±0.52 | 13.6±0.29  | 5.87±0.06      | 39.97±0.19    | 409.9±12.25     | 65.35±0.3                | 57.7±0.63                               |
| II      | 46.87±0.25  | 38.68±0.32 | 14.5±0.14  | 5.72±0.02      | 41.46±0.32    | 460±14          | 61.6±1.1                 | 54.7±0.84                               |

In general, the physical and chemical indicators of muscle tissue of all carcasses of studied yelts are characterized by good quality. It should be noted that amino acid composition of muscle tissue is a very important indicator of meat quality. Essential amino acids are not synthesized in animal cells, but get into a body as part of food proteins. The deficit of the diet on the essential amino acids leads to a stunted growth, a drop in body weight, and various metabolic disorders and even to death in acute deficiency.
The performed investigations have established that there is no significant difference between groups I and II in the content of certain amino acids, however, group I shows poorer results in the content of valine, isoleucine, leucine and lysine by 0.16 g / 100 g of protein (P> 0.999) 0.2 (P> 0.90), 0.46 (P> 0.999) and 0.39 (P> 0.999) g / 100 g protein respectively.

In the proposed premixes are found some macro- and microelements: calcium, phosphorus, sodium, chlorine, iron, copper, zinc, manganese, cobalt, iodine, etc.

These enrichment mixtures - premixes - provide high economic efficiency: they reduce the feed consumption to 12%. This fact is proved by the data of Table 5.

**Table 5 – Costs of fodder per day for calves and poultry for different diets**

| Kind of feeding | Feed consumption, kg |
|-----------------|----------------------|
| 1               |                      |
| Unbalanced food:|                      |
| For calves      | 7-8                  |
| For poultry     | 3                    |
| 2               |                      |
| Full balanced feed for all nutritional factors: | |
| For calves      | 6-7                  |
| For poultry     | 2.6                  |

Premixes are available in the form of powder products. The size of the powder particles of milk-protein premixes is $10^{-4}$ cm. It is proposed to produce protein-fat-vitamin-mineral and carbohydrate premixes. When calculating the prime cost of prime, the cost of raw materials, depreciation of equipment, energy costs, commodity profit are taken into account. Based on the studies performed in this section, it was found that after a 7-month storage, the losses of methionine, calcium pantothenate, folic acid and vitamin A were small, therefore, the storage times of protein and carbohydrate premixes with a moisture content of 10-13% were determined; They are 5-9 months. Premixes are stored in dry, clean, cool, well-ventilated rooms. Can be stored under a canopy.

The results of using premixes for feeding farm animals and poultry are presented in the table 6. Types of farming animal’s and birds

**Table 6 – Results of use of premixes for feeding cattle and poultry**

| Types of farming animals and birds | Consumption Premix per day per 1 animal, g | Weight gain,% | Advantages of using premixes |
|-----------------------------------|-------------------------------------------|--------------|------------------------------|
| Calves                            | 70-350                                    | 22.2         | Increasing body weight, reducing the incidence of young animals, increasing biological value and organoleptic indicators of meat, reducing fattening costs, reducing the age of the first calving, increasing the thermal stability of milk. |
| Laying hens                       | 20-100                                    | 7-10         | Increase the egg-laying rate of chickens from 213 to 320 eggs per year, reduce morbidity, mortality, embryo freeze, improve the quality of egg protein, the strength of the shell, improve protein-fat metabolism in the body. |
| Broiler chickens                  | 30-150                                    | 14           | Increasing muscle mass, reducing the cost of feeding by 10-12%, reducing the incidence and mortality of chickens, improving the quality of meat, improving the immunity and digestibility of nutrients. |
All the studied indicators in the experimental batches of calves, chickens and chickens significantly exceed these parameters in control batches of animals and birds.

4. Conclusions
The problem of proper feeding of cattle is particularly relevant today, as the cost of production, the share of expenditure on food occupies larger proportion and according to various sources animal productivity in our plants depends on the feeding factor by 70-90%. Today unbalanced feeding inhibits expression of high genetic potential of animals. in recent decades scientific advances in animal nutrition is far ahead of the practical success of livestock breeding, and for most practitioners there is a lack of current knowledge about normalized animal nutrition.

Premixes do not include antibiotics, tranquilizers, flavors, flavoring agents, stabilizers, detergents, antioxidants, preservatives, vegetable protein and fat, meal, cake, meat-bone and fish meal, and other components usually included in premixes. However, this does not reduce their nutritional and biological value and the economic effectiveness of the resulting protein and lactose premixes.

It has been additionally established that carbohydrate premixes stimulate the development of bifidogenic microflora of the intestines of animals, reduce diarrheal phenomena, which positively affects the vitality of chickens and the growth of productivity of cattle.

As a result of the studies, a technical specification was developed and a sanitary and hygienic certificate for the use of modified flocculants in industry.

The concept of creating a non-waste technology for the processing of whey and dairy flushing water has been developed and the possibility of creating a water rotation cycle at dairy enterprises has been proved by purposeful and complete isolation of fats and proteins from whey and dairy flushing water, followed by processing of the solid phase for vitamin-protein premixes, And the liquid fraction for milk sugar – lactose.

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