STUDY OF THE EFFECT OF PROTEIN-VITAMIN-MINERAL FEED ADDITIVES ON THE INCREASE IN LIVE WEIGHT OF HORSES

ANNOTATION

Agriculture is considered an important industry for Kazakhstan. Consumer demand for livestock products (beef and dairy cattle) is very high. Protein-vitamin feed additives are of great importance in the breeding of meat and dairy animals. Feed additives not only increase live weight gain, but also strengthen the immunity of animals and increase resistance to adverse environmental factors. The article discusses the results of experimental studies on the influence of a feed additive of a new composition on the physiological condition of horses on the yield and quality of meat products. As an object, horses of the Kazakh breed aged 1.5-2.0 years were selected, that located in the stall. Based on the study of blood composition, an increase in the values of erythrocytes, hemoglobin, leukocytes and platelets was revealed in the experimental groups of horses taking the feed additives, compared with the animals of the control group. This indicates the activation of immunity and the improvement of protein-carbohydrate metabolism in horses of the experimental groups. The purpose of the research work is to study the effect of a protein vitamin mineral feed additive on the meat and productivity of horses. This feed additive allows you to expand the range of feed additives that increase the live weight gain of farm animals.

Key words: feed additives, animals, vitamins, horses, metabolic processes, proteins, and agricultural production.

Introduction. The leading agricultural sector in Kazakhstan is animal husbandry, which satisfies the population need for basic food products. In this regard, special attention is focused on improving animal productivity, improving product quality, and reducing its cost [1].

The development of livestock production largely depends on the state of the forage base and the balanced feeding of farm animals. Most of the feed balance includes feed products produced from forage crops grown in a particular region, in particular, the Turkestan region, as well as feed products obtained from the processing of grain and industrial crops.

In recent years, foreign and domestic scientists have proven and scientifically substantiated the expediency of introducing various feed additives, including energy ones, into the composition of recipes for cattle. This is due, first of all, to the increased genetic potential of animals and the development of new technologies in the production of feed additives [2].

As a result of the increase in livestock production, i.e. intensive industrial animal husbandry has caused a lot of stress in animals. As a result, the number of diseases of the digestive system increased in farm animals, and, accordingly, this negatively affected the productivity of animals [3-4].

The problem of full-fledged feeding of farm animals is becoming increasingly important. It has been proven that it is important not only to satisfy the needs of animals for the main nutritional factors,
but also the ratio of individual nutrients in the diet (sugar-protein, energy-protein, acid-base), in the absence of antinutritional and toxic substances in the feed [5].

The source of the most important mineral substances for farm animals is vegetable feed. However, the mineral composition of feeds is subject to significant fluctuations depending on their quality, zonal, and other factors. Animals often lack certain elements in their diets. Therefore, in the practice of animal husbandry, it is necessary to widely use mineral supplements to balance diets with missing macro- and microelements on the basis of the recommended norms of requirements, taking into account their content in feed. Depending on the missing 11 mineral elements, appropriate mineral supplements of natural and artificial origin are introduced into the diet of animals [6].

Since the second half of the 20th century, animal husbandry has developed well. In order to obtain quality food and ensure high productivity of animals, the introduction of antibiotic growth promoters into animal feed has been used as a common preventive practice to improve the gastrointestinal health of animals [7-9]. A group of beneficial microbes is used as feed additives in Europe [10]. They were first used in animal husbandry in the 20th century to improve feed efficiency and reduce diarrhea in pigs, and to reduce intestinal colonization by Salmonella in chickens [11].

Improving the safety of animals and their productivity depends mainly on the conditions of animal housing and the quality of the food supply. The feed used for feeding farm animals must contain nutrients in an assimilable form, must not have a harmful effect on the health of animals and the quality of the products received from them. The completeness of the feed is characterized by the content of proteins, a wealth of vitamins, macro- and microelements, and the content of other easily digestible nutrients [12].

In practice, diets of natural animals feed for regulating metabolic processes in their organisms, namely, to satisfy the needs for proteins, vitamins, and minerals, to suppress the activity of certain groups of microbes, stimulate growth and development, feed additives of various nature and compositions are added [13-14].

Neglecting the existing prohibitions, many farms are introducing certain amounts of antibiotics into feed or feed additives to preserve livestock and stimulate animal growth. As a result of the use of antibiotics in animal husbandry, there is a danger of the emergence of stable forms of pathogenic microorganisms in the environment and a decrease in the therapeutic effect of many antibiotic substances in human disease [15-16].

In this regard, the World Health Organization announced the need to stop the regular use of antibiotics in order to stimulate the growth and prevention of diseases among healthy farm animals. WHO pointed out the usefulness of agricultural production without antibiotics by using an alternative to antibiotics to feed animals. [17-18].

The use of antibiotics in agriculture also negatively affects the quality and safety of the final product, which is noted by many international organizations (WHO, etc.) [19].

Other substances actively used to increase the productivity of animals are hormonal preparations. According to the official report of the European Union, meat supplied from abroad contains hormones - estrogens, gestagens, androgens, etc. These hormones are regularly administered to animals to increase meat productivity and achieve minimal costs for feeding and care, and, accordingly, to maximize profits [20].

The productivity of cattle depends on competent and high-quality nutrition. Various beneficial substances help to balance the diet, provide better digestibility of food, and strengthen the immune system of animals. Enriching the feed base with additives allows milk and meat producers to effectively overcome the difficulties associated with feeding and achieve high production rates.

Over the past decades, the zootechnical science of animal nutrition has accumulated a large amount of experimental data on various nutrients, feed efficiency, and product formation [21].

Every year, in connection with the intensification of animal husbandry, the problem of full-fledged feeding of farm animals is becoming increasingly important. A special role is played by unconventional feed additives, which, due to improving the quality of diets and improving the physiological state of the body, provide environmentally friendly, competitive, and widely demanded products.

An analysis of literature indicates the widespread use of residues of cotton processing plants, consisting of flaps, cups, bolls, and cotton leaves as additives in traditional feeds to increase the nutritional value of [22], to stimulate the growth as a growth-promoting additive metal peroxide (Ca, Mg, Zn) are used [23]. But, however, these feed additives do not contain animal proteins, namely, essential amino acids of animal origin.

A number of feed additives have been developed by scientific teams of Russia [24-25]. For example, one can note a feed mixture with a high content of complete protein extracted from
homogenized biomass of earthworms, mineral additives, yeast, and plants from homogenized biomass obtained using complex technological manipulation [24].

In the work of Irikova O.V. and Zabudsky Yu.I., a laborious and seasonal method for the production of protein and vitamin feed flour from a hybrid of red California earthworm grown on a substrate of apple pomace was proposed [19]. To obtain feed flour, a substrate is prepared from apple pomace, grinding and moistening up to 80-90%. Worms are populated in this substrate and vermicomposting is carried out for 20 days. The obtained mass is dried by the convective method for 2 hours at a temperature of 21 °C and then for a similar period of time drying of the mixture continues in vacuum at a temperature of 24-27° C. To prepare a commodity form, the resulting dry mass is crushed in a mill to a particle size of 0.02-0.03 mm. The feed mixture, which consists of two components, does not have a high nutritional value, since it contains insufficient nutrient, mineral elements, and plant fiber.

In conditions of intensive development of animal husbandry, only by organizing full-fledged feeding of animals, it is possible to achieve success in obtaining high-quality, environmentally friendly products. In this regard, every year there is a growing interest in the use of new effective feed additives based on the use of non-traditional drugs and biologically active substances in a new generation in animal feeding.

The aim of this study is to obtain a new biologically active feed additive with high nutritional value on the basis of available renewable raw materials, which allows to improve the meat productivity and physiological state of horses in fattening.

**Objects and research methods.** For the experiments, horses of the Kazakh breed aged 1.5-2.0 years were used. They belonged to the farm and were in a stall. The choice of these animals is associated with an increase in the world market for horsemeat, which is a dietary product rich in highly unsaturated fatty acids (linoleic, linolenic, arachidonic), which favorably influences the metabolism of cholesterol in the human body, and prevents the development of atherosclerosis [26-28].

The intrabreed type of jabe shows itself especially well: the slaughter yield is about 53-57%, and often all 60%; milk production averages about 10 kg per day.

Horse meat is an excellent regulator of metabolism and has the property of drainage of bile in the intestine. Horse meat is used in diet therapy of obesity and supplies a number of necessary microelements, vitamins, and essential fats to the body, and has the ability to neutralize radiation and other harmful effects of ecotoxicants on the human body [29-30]. This creates a real precondition for increasing the export of fattened horses from the republic.

Of the horses, 4 groups (1 control and 3 experimental) were formed taking into account the age, fatness, and physiological condition of the group, each consisting of 5 horses, weighing between 217-229 kg. The Kazakh horse is able to feed on pastures. Their diet consists of highly concentrated, coarse, juicy, and green foods in summer. Feed mixtures based on oats and barley are used as concentrates. For feeding animals, a daily ration of the following composition was used: 750 g wheat flour (3rd grade), 10 kg of clover of 1st cut, 3 kg of bran. The main feed was added to a feed additive of the following composition: 1% dry biomass of California red worms, 2% seaweed, 2% calcium peroxide, 0.5% calcium humate, 5% sodium chloride, 0.5% vitamin complex, 20% corn bran, the rest is a mixture of sunflower oil cake and meal (1:1). We did not add a feed additive to the main diet of the control group. We added a feed additive in amounts of 200 g, 400 g and 600 g to the main diet of the experimental groups (first, second and third). For a day, horses additionally received from 0.2 to 0.6 kg of feed additive with two meals (morning and evening). Table 1 shows a scheme of the experiment with a feed additive for horses.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of horses, n</th>
<th>Feeding index</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>5</td>
<td>13 kg (Basic ration) + 0 g</td>
</tr>
<tr>
<td>experimental group 1</td>
<td>5</td>
<td>13 kg (Basic ration) + 200 g</td>
</tr>
<tr>
<td>experimental group 2</td>
<td>5</td>
<td>13 kg (Basic ration) + 400 g</td>
</tr>
<tr>
<td>experimental group 3</td>
<td>5</td>
<td>13 kg (Basic ration) + 600 g</td>
</tr>
</tbody>
</table>

Before feeding, they were regularly watered 2 times with clean water to a total volume of 45-50 liters. In general, fattening lasted 2 months before the slaughter of animals. The absolute (kg / day) and relative (%) increase in live weight, the yield of meat products were determined using widely known practical methods of calculation [31].

All kinds of effects on the tissues of the body are reflected in the composition and properties of blood. Therefore, it is important to determine the blood composition of horses. Blood was taken from the
horses from the jugular vein. We used the MELET SCHLOESING MS4-3 hematological analyzer to determine hematological parameters. Statistical processing of the results of the study was done using a personal computer and the Microsoft Excel program. Student's confidence criterion was used to calculate the level of differences.

Results and discussion. During the study, to control the physiological state of animals, the biochemical and morphological composition of the blood taken from horses of the experimental and control groups was studied. The content of hemoglobin, erythrocytes, leukocytes, and platelets in the blood of animals was determined (table 2).

Table 2 – Hematological indicators of blood of foals

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Control</th>
<th>Added concentration of feed additives in the main diet, kg (No. of groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0,2 (1)</td>
</tr>
<tr>
<td>Erythrocytes, 10^{12}/l</td>
<td>6,19±0,31</td>
<td>7,02±0,40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7,92±0,32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7,90±0,33</td>
</tr>
<tr>
<td>White blood cells, 10^9/l</td>
<td>20,8±0,55</td>
<td>21,4±0,39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21,6±0,51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22,8±0,46</td>
</tr>
<tr>
<td>Hemoglobin, g/l</td>
<td>98,8±4,1</td>
<td>110,3±4,2*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>118,1±5,0*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120,0±4,4*</td>
</tr>
<tr>
<td>Platelets, 10^9/l</td>
<td>460,1±5,7</td>
<td>482,5±5,3*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>490,3±4,9*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>493,0±6,2*</td>
</tr>
</tbody>
</table>

*P≥0,05

As a result of biochemical studies of the blood of horses from the experimental and control groups, the increase in hemoglobin content in the experimental groups was found to be 11.5 g/l (group 1), 19.3 g/l (group 2) and 21.2 g/l (3 group), respectively, compared with the control group (P≥0,05).

Platelets take an active part in blood coagulation and nonspecific protective reactions of the body. In our experiment, at the final stage, the formed elements range from 460.1 to 493.0 • 10^9/l, in percentage terms, the difference in platelet count is 4.9–7.1% in the experimental groups compared to the control group (P≥0,05). This proves the predominant tendency to increase the assimilation of nutrient components in the experimental groups, especially inorganic microingredients.

As can be seen from the results of hematological studies of the blood of animals participating in the experiments, an increase in indicators was revealed - red blood cells, hemoglobin, white blood cells and platelets, which indicates the activation of cellular immunity, indicates a correct metabolism as a result of obtaining good nutrition.

The digestibility of starch in horses varies from 87% to 100%. Horses have low activity of the pancreatic enzyme alpha-amylase, which can compromise the prececal digestibility of diets high amounts or sources of this morphologically complex nutrient (Kinze, 1994; Meyer, 1995) [32-33]. The post-feed plasma glucose concentration, referred to as the glycemic response, may be affected by particle size, degree of heat treatment, protein composition, fat content, and fiber content of the feed. The biochemical structure and absorption process of carbohydrates may depend on the content and interval of the previous meal period (Morgado, 2009) [34]. In most cases, all soluble carbohydrates that enter the body are absorbed into the blood and plasma (Santos, 2002) [35].

Table 3 presents the results obtained in the study of the chemical composition and caloric content of meat of the control and two experimental groups, in the diet of which additionally introduced feed additives (FA). It shows the increase in protein and fat in the meat of the experimental groups compared to the control, while the content of both protein and fat increases with increasing concentration of the feed additive in the feed.

Table 3 – The chemical composition of horse meat, %

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Group experienced with the use of FA, kg / day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0,2</td>
</tr>
<tr>
<td>moisture</td>
<td>70,33±2,23</td>
</tr>
<tr>
<td>protein</td>
<td>17,62±0,75</td>
</tr>
</tbody>
</table>
From the results of studies on the effect of feed additives on animal body weight gain, it follows that the proposed ratio of components normalizes microbiocenosis, increases feed digestibility by activating the gastrointestinal tract, and improves protein carbohydrate metabolism (figure 1).

Figure 1 – The effect of feed additives on the increase in live weight of horses

Based on the analysis of the results of experimental studies, it can be noted that feeding horses of the experimental groups with a protein-vitamin-mineral feed additive helps increase live weight gain (figure 2).

The total average live weight of 1 horse of the experimental group, fed with feed additives, was ~344 kg. The weight of meat obtained after slaughter, including internal fat, liver, kidneys, heart, and other entrails, weighed 206 kg, which corresponded to a slaughter yield of 59.8%. The slaughter yield for horses of the control group that were fed without feed additives did not exceed 53.3%.
Conclusions. On the basis of experimental studies, the effectiveness of including a feed additive in the main diet of horses, containing along with a complex of vitamins, minerals, and biomass of red California worms, which is characterized by a number of medicinal properties has been established. Blood biochemical parameters of all experimental animals were within the standard parameters. The feed supplement helped to increase the average slaughter yield to 59.8%.

The possibility of expanding the range of feed additives contributing to the production of high-quality horse meat with a high content of protein (~19%) and fat (~12%) is shown.

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ТУЙІН
Ауыл шаруашылығы Қазақстан мемлекеті ушін маңызды сектор болып саналады. Өсірісе, мал шаруашылығы (етті және етті-суітті ірі кара мал) онімдірінің тұтынушылық сурanness оте жоғары. Етті – суітті мал осіріude дәрудендірілген жем - азықтық коспалардың маңызы зор болып табылады. Жем-азықтық коспалар жануарлардың салмақ массасын арттырып қана қоймай, олардың иммундық жүйесін нығайтады және сыртқы ортаның көлігісін факторларына тәсіділігін арттырады. Макала да жана жем-азықтық коспа құрамыңың жылқылардың физиологиялық жағдайына, ет өнімдің шығымы мен сапасына әсерін тәжірибелік зерттеудің нәтижелері қарабылышынан. Зерттеу жұмысының нәтижесін өсірінді сұраныс өте жоғары.

РЕЗЮМЕ
Сельское хозяйство считается важной отраслью для Казахстана. Потребительский спрос на продукцию животноводства (мясного и молочного скотоводства) очень высок. Белково-витаминные кормовые добавки имеют большое значение в разведении мясных и молочных животных. Кормовые добавки не только увеличивают прирост живой массы, но и укрепляют иммунитет у животных и повышают устойчивость к неблагоприятным факторам внешней среды. В статье рассмотрены результаты экспериментальных исследований влияния кормовой добавки на физиологическое состояние лошадей, на выход и качество мясной продукции. В качестве объекта были выбраны лошади казахской породы в возрасте 1,5-2,0 года, находящиеся в стойле. На основе исследовательских данных в составах крови лошадей выявлено повышение показателей эритроцитов, гемоглобина, лейкоцитов и тромбоцитов у опытной группы, получавших кормовые добавки, по сравнению с животными контрольной группы. Это свидетельствует об активации иммунитета и улучшении белково-углеводного обмена у лошадей опытной группы. Целью научно-исследовательской работы является изучение влияния белково-витаминно-минеральной кормовой добавки на мясность и продуктивность лошадей. Данная кормовая добавка позволяет расширить ассортимент кормовых добавок, увеличивающих прирост живой массы сельскохозяйственных животных.