The use of silos from legume-cereal grass mixtures and energy feed additives in the feeding rations of new-bodied first-calf cows

V Kosolapov¹, B Sharifyanov², K Ishmuratov¹, V Kosolapova³ and E Salikhov²

¹Federal Williams Research Center of Forage Production & Agroecology, st. Nauchnyi gorodok, k 1, Lobnya, Russia
²Ufa Federal research center of the Russian Academy of Sciences, Bashkir research Institute of agriculture, Karl Marx str., 16/2, Ufa, Bashkortostan Republic, Russia
³Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, Timiryazevskaya st., 49, Moscow, Russia.

Corresponding author’s e-mail: ishmuratov_57@mail.ru

Abstract. The paper presents a technology for obtaining dried silos prepared from herbs of legume-cereal mixtures, which ensures maximum preservation of nutrients and high quality of feed. The chemical composition and nutritional content of feed, the norms for the introduction of tested silos into the main feeding diet, and the dose for the introduction of an energy feed additive were determined. Based on the balance sheet experience, the digestibility of the main nutrients was calculated, the hematological and biochemical status of blood was revealed, the productivity and quality of first-calf milk was estimated, and feed costs for the production of 1 kg of milk were established.

Keywords: silage, chemical composition, nutrition, feeding ration, digestibility, blood composition, productivity, feed costs, first-calf cows

1. Introduction
The priority of juicy feeds and a source of vitamins for ruminants in winter is silage. The main technological method for improving the quality of harvested feed is drying the green mass up to 30% of dry matter and the use of preservatives [1,2]. Silage provides the maximum yield of nutrients per unit area and is considered to be the most efficient, economical method of harvesting juicy feed [3-6].

The purpose of the work was to apply a rational method of silage (drying) of herbs from legume-cereal mixtures with a new-generation preservative Biosib, which ensures maximum preservation of nutrients and high quality of feed, and then their testing as part of the main feeding diet together with the energy feed additive Bergafat T-300 at the peak of lactation of first-calf cows.

2. Methods and materials
The experiment adopted the following scheme of experience (table 1).
Table 1. Experience scheme

| Numbers in order | Group                | Number of goal | Characteristics of feeding                                      |
|------------------|----------------------|----------------|----------------------------------------------------------------|
| 1                | And control          | 10             | Main ration (MR) +20 kg of silage alfalfa and boneless stalk    |
| 2                | II experienced       | 10             | MR +20 kg of silage mix of Eastern goat and boneless stalk      |
| 3                | III experienced      | 10             | MR +25 kg of silage mix of Eastern goat and boneless stalk + 300 g Bergafat T-300 |

To conduct the experiment on the principle of pairs of analogues (breed, level of productivity, live weight), 3 groups of new cows were selected-first-born cows with 10 heads each.

The conditions for keeping animals of all groups were the same. The beginning of the accounting period (90 days) was preceded by a two-week preliminary stage with the same feeding in all groups. During the accounting period, feeding of experimental first-born Chicks was carried out according to the daily routine adopted in the farm.

Characteristics of feeding were: heifers of I control group received the ration 20 kg of silage of a mixture of alfalfa and smooth brome-grass; in the II experienced the same amount of silage of a mixture of Galega and awnless brome; in the third experimental group, 25 kg of silage of a mixture of Galega and awnless brome and 300 g/head/day energy feed additives when reducing the cottages concentrates 25%.

For the preparation of tested feeds in the conditions of the farm, 5 hectares of crops were allocated for a mixture of alfalfa and bonefish, as well as Eastern goat and bonefish [11-13]. From these stands, 10 tons (in each variant) of dried silos were prepared using a new generation of biosib preservative [8].

The chemical composition, protein and energy nutrition of feed was studied in the analytical laboratory FSBScl of the Bashkir Research Institute Of Agriculture and Bashkir Research-And-Production Veterinary Laboratory using the generally accepted methods of All-Russian Institute Of Animal Husbandry and All-Russian Scientific Research Institute of Physiology, Biochemistry and Nutrition.

During the entire experiment, all groups were provided with group normalized feeding with diets balanced with all nutrients and biologically active substances in accordance with detailed norms for feeding first-born cows [7].

Daily records were kept of the specified feed and their residues to determine the influence of the studied factors on the appetite of animals, their feed consumption and its costs per unit of production.

The productivity of experimental first-calf cows was studied by conducting weekly control milking with the determination of fat and protein content in milk.

The balance experiment was carried out at the peak of the new year period on 3 cows from each group, according to the research methodology.

3. Results and discussion

The chemical composition and nutritional value of the feed used in the experiment were studied in order to make up the feeding rations, according to the research methodology.

Comparative calculations showed that in 1 kg of silage from a mixture of Eastern goat and boneless stalk, the content of exchange energy was higher – by 8.6%; raw protein by 14.3 %, and the concentration of raw fiber on the contrary was lower by 6.3% compared to the same feed from the alfalfa-stalk mixture.

The studied energy feed additive Bergafat T-300 contained 26.4 MJ of exchange energy in 1 kg of mass [10]. The concentration of saturated fatty acids was 80-85%.

An increase in the content of nutrients and energy in silage from a mixture of Eastern goat and boneberry is the result of an increased concentration of dry matter.

According to the requirements of detailed feeding standards and on the basis of data on the chemical composition and nutritional content of feed, feeding rations were compiled (table 2).
Replace 20 kg of silage of a mixture of alfalfa and smooth brome-grass with the same feed of a mixture of Galega and awnless brome in the same amount, contributed to increasing the nutritional value of feeding the experimental group II, where the content of the ECE was higher by 3.9%, crude protein 92 g, digestible protein – 7.1%, raw fat 13.3%, and the concentration of crude fiber decreased by 2.5% compared to the control.

In the feeding ration of animals of the III experimental group, the amount of silage from a mixture of Eastern goat and boneless stalk was increased to 25 kg / head/day. In addition, we added 300 g / head/day energy feed additive, which was a dry loose powder, well mixed with concentrated feed [9,14,15].

**Table 2. Feeding rations of experimental animals**

| Indicator | Group And control | II experienced | III experienced |
|-----------|------------------|----------------|----------------|
| Silage, alfalfa + stalk, kg | 20 | - | - |
| Silage, eastern goat+stark, kg | - | 20 | 25 |
| Legume-grain hay, kg | 4 | 4 | 4 |
| Mixed grass haylage, kg | 10 | 10 | 10 |
| Mixture of concentrates, kg | 4 | 4 | 3 |
| Feed molasses, kg | 1 | 1 | 1 |
| Bergafat T-300, g | - | - | 300 |

The diet contains:

| Indicator | Group And control | II experienced | III experienced |
|-----------|------------------|----------------|----------------|
| Energy Feed Unit (EFU) | 15,4 | 16,0 | 17,1 |
| Exchange energy, megajoule (MJ) | 154,2 | 160 | 171 |
| Dry matter, kg | 16,4 | 16,6 | 17,0 |
| Raw protein, g | 2075 | 2167 | 2180 |
| Digestible protein, g | 1288 | 1380 | 1395 |
| Raw fat, g | 450 | 510 | 516 |
| Raw fiber, g | 4018 | 3916 | 4125 |
| Sugar, g | 1045 | 1085 | 1097 |
| Calcium, g | 128,3 | 130,3 | 135,6 |
| Phosphorus, g | 74,1 | 76,1 | 77,3 |
| Magnesium, g | 35 | 39 | 41 |
| Potassium, g | 350 | 348 | 334 |
| Sulfur, g | 36,2 | 36,0 | 34,8 |
| Iron, mg | 4407 | 4347 | 4416 |
| Copper, mg | 135 | 139 | 145 |
| Zinc, mg | 515 | 521 | 531 |
| Manganese, mg | 895 | 875 | 882 |
| Cobalt, mg | 4,7 | 4,7 | 4,8 |
| Of iodine, mg | 3,8 | 3,8 | 4,0 |
| Carotene, mg | 1031 | 1071 | 1085 |

At the same time, the amount of concentrated feed was reduced from 4 to 3 kg, or by 25% in relation to the I control and II experimental groups in the diet of first-born Chicks of the III experimental group.

An important point in explaining the metabolism that occurs in the body of animals is the study of individual processes of the physiology of digestion.

To do this, we studied the digestibility of nutrients in the feeding diets (table 3). The results of balance experiments showed that the introduction of feeding heifers experimental groups studied silage with specified characteristics contributed to an increase in digestibility of all nutrients.

The digestibility of dry matter in the control group was 61.35%, and in the experimental groups 64.12 and 65.23%, or 4.5 and 6.3% higher compared to the control.
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Table 3. Digestibility of nutrients, %

| Indicator | And control | II experienced | III experienced |
|-----------|-------------|---------------|----------------|
| Dry matter | 61,35±1,15  | 64,12±0,96    | 65,23±0,98    |
| Organic matter | 62,45±1,27  | 65,24±1,09    | 68,18±1,06    |
| Crude protein | 63,27±0,85  | 65,18±0,98    | 67,34±1,04    |
| Crude fat | 62,84±1,03  | 64,33±0,96    | 66,07±0,91    |
| Crude fiber | 42,37±0,95  | 46,19±0,98    | 49,81±1,03    |
| Nitrogen-free extractive substances (NfES) | 67,12±1,04 | 69,54±0,92    | 71,03±0,95    |

The use of experimental groups of silage in the diets of animals from a mixture of Eastern goat and stalk separately and with an energy feed additive contributed to an increase in the digestibility of organic matter by 4.5 and 9.2% compared to control analogues that received silage from a mixture of alfalfa and stalk.

The low content of raw fiber in the experimental groups also contributed to an increase in the digestibility of raw protein by 3.0 and 6.4%, and raw fat-by 2.3 and 5.1% compared to control analogues.

The high leafiness of Eastern goat meat resulted in an increase in the digestibility of raw fiber in the experimental groups by 9.0 and 17.5% compared to the control group, where the animals received silage from a mixture of alfalfa and boneless stalk. The digestibility of Nitrogen-free extractive substances in the experimental groups was higher by 3.6 and 5.8% compared to the control group.

In the body of animals, the blood quickly reacts to changes in external and internal factors, especially if it is associated with the process of feed consumption. The biochemical status of the blood of experimental animals is shown in table 4. It should be noted that the blood parameters of experimental animals of all groups were within the limits of physiological norms.

The use of 20-25 kg of silage from a mixture of Eastern goat and boneless stalk separately and in combination with an energy feed additive in the amount of 300 g/head/day in the rations of first-born Chicks of experimental groups contributed to an increase in the blood concentration of total protein by 5.5 and 12.3% compared to control peers.

Table 4. Digestibility of nutrients, %

| Indicator | And control | II experienced | III experienced |
|-----------|-------------|---------------|----------------|
| White blood cells, 10^9/l | 7,5±0,12 | 7,9±0,16 | 8,1±0,14 |
| Red blood cells, 10^{12}/l | 6,0±0,21 | 6,4±0,18 | 6,5±0,16 |
| Hemoglobin, g/l | 108±5,18 | 110±5,43 | 115±5,75 |
| Total protein, g/l | 73±2,74 | 77±2,15 | 82±2,57 |
| Urea, mmol/l | 5,3±0,34 | 4,5±0,25 | 4,3±0,31 |
| The nitrogen index | 2,2±0,12 | 2,7±0,08 | 3,0±0,15 |
| Total lipids, mg% | 4,6±0,19 | 4,8±0,23 | 5,0±0,16 |
| Inorganic calcium, mmol/l | 2,46±0,75 | 2,63±0,53 | 2,75±0,47 |
| Inorganic phosphorus, mmol/l | 1,48±0,31 | 1,59±0,24 | 1,67±0,19 |
| Vitamin A, mmol/l | 1,4±0,41 | 1,6±0,33 | 1,9±0,26 |

At the same time, there was a decrease in the level of urea in the blood of animals of the experimental groups by 0.8 and 1.0 mmol/l compared to the control group, where first-hatches received 20 kg of silage from a mixture of alfalfa and boneless stalk as part of the diet. The nitrogen index of the blood of the experimental groups was higher by 0.5 and 0.8 points compared to the control, which indicates better use of nitrogen feed by animals of the experimental groups. This fact and a higher level of total protein in the blood of animals of experimental groups may be a consequence of the intensification of biosynthesis processes in the body.
The level of lipid metabolism metabolites in the blood allows us to judge the effectiveness of using raw fat in the diet. The content of total lipids in the blood of cows of the experimental groups was higher by 4.3 and 8.6% compared to control analogues.

Feeding of the experimental groups of silos to first-born Chicks increased the concentration of minerals in the blood: calcium-by 9.3 and 14.5%, phosphorus-by 7.4 and 12.8% compared to animals from the control group.

It is known that the animal organism with oxygen and remove carbon dioxide occurs due to the hemoglobin, the transport role of red blood cells. The content of hemoglobin in the blood of animals of the experimental groups was higher by 1.9 and 6.5%, and red blood cells-by 6.7 and 8.3%, than in the control group.

The protective function of the body is mainly performed by white blood cells. Tests showed that the content of white blood cells in the blood of animals of the experimental groups was higher by 5.3 and 8.0% than in the control group, which indicates an increase in the protective forces of the animal body.

The main criterion for evaluating a fully balanced feeding of animals is the level of productivity and quality of the resulting products.

The productivity of experimental cows is shown in table 5.

**Table 5. Digestibility of nutrients, %**

| Indicator                          | Group                        |
|------------------------------------|------------------------------|
|                                    | And control | II experienced | III experienced |
| Produced natural milk for the period of experience, kg | 1467 | 1548 | 1575 |
| The average daily milk yield of natural milk, kg     | 16,3       | 17,2       | 17,5       |
| Contained in milk, %                         |                         |                         |                         |
| fat                                               | 3,75±0,16   | 3,82±0,25   | 3,85±0,22   |
| protein                                           | 3,14±0,18   | 3,40±0,28   | 3,53±0,17   |
| the sahara                                        | 4,18±0,12   | 4,35±0,14   | 4,46±0,15   |
| Average daily milk yield of 4% fat content, kg     | 15,3±0,73   | 16,4±0,75   | 16,8±0,53   |
| In % to control                                  | 100          | 107,2       | 109,8       |

In comparison with the cows of the I control group whose diets were fed 20 kg of silage from a mixture of alfalfa and boneless stalk, in the II experimental group, where the animals received 20 kg of silage from a mixture of Eastern goat and boneless stalk, the average daily milk yield of 4% fat increased by 7.2%.

An increase in silage by 5 kg from a mixture of Eastern goat and boneberry, as well as the introduction of 300 g/head/day of energy feed additives, with a decrease in the proportion of concentrated feed by 25% in the III experimental group, contributed to an increase in daily milk yield by 9.8% compared to the control group's peers.

The inclusion of the studied feeds (silos, as well as an energy Supplement in group 3) in the diets of first-born Chicks led to an increase in the fat content in milk in animals of the experimental groups by 1.8 and 2.6% compared to control analogues.

The use of silage from a mixture of Eastern goat and boneless stalk separately and in combination with an energy feed additive in the studied quantities contributed to an increase in the content of protein in milk by 8.3 and 12.4%, and milk sugar by 4.1 and 6.7% compared to the control.

In our experiment, the different composition of feeding diets had a different effect on the feed consumption per unit of production. Thus, the cost of concentrated feed per 1 kg of milk in the second experimental group, where animals received 20 kg of silage from a mixture of Eastern goat and boneless stalk, instead of the same amount of silage from alfalfa—stalk mixture, was lower by 18 g, or by 6.9%. Feed costs in the cost of livestock products can be up to 65%, the results of which are presented in table 6.
| Indicator                                | Group                        | And control | II experienced | III experienced |
|-----------------------------------------|------------------------------|-------------|----------------|-----------------|
| Silage, alfalfa + stalk, kg             | -                            | 1710        | 1746           | 2205            |
| Silage, eastern goat+stalk, kg          | 342                          | 345         | 350            |                 |
| Legume-grain hay, kg                    | 855                          | 864         | 882            |                 |
| Mixed grass haylage, kg                 | 90                           | 90          | 90             |                 |
| Mixture of concentrates, kg             | 360                          | 360         | 270            |                 |
| Feed molasses, kg                       | -                            | 1377        | 1476           | 1512            |
| Bergafat T-300, g                       | 1377                         | 1476        | 1512           |                 |
| Spent concentrates per 1 kg of milk, g  | 261                          | 243         | 178            |                 |
| In % to control                        | 100                          | 93,1        | 68,1           |                 |
| Cost of Energy Feed Units (EFU) per 1 kg of milk | 1,0                          | 0,97        | 0,96           |                 |
| In % to control                        | 100                          | 97,0        | 96,0           |                 |

In the III experimental group, the cost of concentrated feed for the production of 1 kg of milk decreased by 83 g, which is lower by 31% compared to the control group of first-born Chicks. In terms of energy consumption, the difference between the control and experimental groups was low. Because the animals of the experimental groups received more energy in their diets, which was a consequence of the use of the studied factors in their feeding.

4. Conclusion
The inclusion of 20 kg (II experimental) and 25 kg (III experimental) dried silage from a mixture of Eastern goat and boneless stalk preserved with Biosib and the energy feed additive Bergafat T-300 in the third experimental group in the main feeding ration contributed to an increase in milk productivity by 7.2 and 9.8%, fat content-by 1.8 and 2.6%, protein by 8.3 and 12.4%, milk sugar by 4.1 and 6.7% compared to the control group.

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