**Milk productivity of cows when haylage with biological preservatives is included in the diet**

**Sergey Karamaev¹, Anna Karamaeva¹, Natalia Soboleva², Larisa Bakaeva²**

¹Federal State Budgetary Educational Institution of Higher Education “Samara State Agricultural Academy”, Uchebnaya str. 2, Kinel, Samara region, 446442, Russia
²Federal State Budgetary Educational University of Higher Education «Orenburg State Agrarian University», Orenburg, 460795, Russia

E-mail: karamaevsv@mail.ru

**Abstract.** In the Middle Volga region, galega orientalis is used as a promising fodder crop for the legume family. The main disadvantage of galega orientalis is poor silage due to the low sugar content in plants. To eliminate this drawback, Laxil and Silostan biologics have been developed, which are based on live cultures of lactic acid bacteria. The aim of the research was to study the influence of haylage from galega orientalis, prepared with the addition of biological preservatives to the green mass, on milk productivity and milk quality of Holstein cows. In the experimental groups, compared with the control, the quality of haylage, indicators of scar metabolism, digestibility of nutrients in the diet, milk productivity of cows and milk quality were studied. It was found that in 1 kg of silage of the experimental trenches, the contents of metabolic energy, digestible protein, crude fiber were higher. With the inclusion of silage in the ration, the number of bacteria, ciliates, the content of protein nitrogen, the proportion of acetic acid in the composition of volatile fatty acid (VFA) were increased in the rumen fluid in cows. Cows better digested the dry matter of feed, crude protein, and crude fiber. As a result, the yield of milk of cows for 305 days of lactation in terms of basic fat and protein was higher by 11.6-15.9%. The chemical composition and physical properties of milk have improved by all studied indicators.

1. **Introduction**

The main factor in increasing the productivity of cattle is a strong feed base, the quality of harvested feed, preparing it for feeding, and feeding animals with full, nutrient-balanced diets. The most important indicator of the usefulness of feeding highly productive dairy cows is the level of protein in the diet. The existing protein deficiency in animal feed of dairy herd leads to the shortfall of agricultural enterprises to 30-35% of livestock products. This problem can be solved by increasing the structure of the feed wedge legumes. There is a need to expand the set of high-protein crops suitable for cultivation in the climatic zone of the Middle Volga region with a sharply continental climate. At the same time, one of the promising forage crops may be galega orientalis [1-6].

Compared to the forage crop, which is widespread in the region – medicago sativa, the galega orientalis has a number of advantages. It is a perennial plant of the legume family, capable of producing high yields for 20 years. Yields, depending on soil fertility and level of agricultural technology, can vary from 350 to 700 C/ha of green mass. The proportion of leaves in green mass is 60-75%, the nutritional value of 1 kg of feed – 0.2-0.28 feed unit and 35-39 g of digestible protein.
Culture early maturing, tolerates spring frosts and can be a good alternative to winter rye in the translation of dairy cows on summer feed rations. Unlike medicago sativa and clover, the leaves of galega orientalis do not crumble when drying, which allows preparing high quality hay [7, 8, 9, 10, 11].

Like all legumes, galega orientalis, due to the low content in plants of sugar, has a pure ensilage. Therefore, to obtain high quality silage and haylage, the use of preservatives is a prerequisite. For these purposes, the Institute of Microbiology of NAS of Belarus together with the Scientific innovation enterprise “BashInkom” of the Republic of Bashkortostan developed biological preservatives “Laksil” and “Silostan”, designed to improve the quality and aerobic stability of silage fodder from vegetable raw materials. The basis of the preparations are two strains of lactic acid bacteria of the genus Lactobacillus and a new generation veterinary probiotic including two natural strains of B. Subtilis [12].

Due to the fact that the basic bulky feeds in the diet of dairy cows is haylage, the aim of this work was to study the effect of haylage from the galega orientalis, prepared with the addition of biological preservatives “Laksil” and “Silostan” in the green mass, on the milk productivity and milk quality of Holstein cows.

2. Material and methods
The research was carried out in a modern complex for the milk production of LLC “Radna” in the Samara region. The object of research were cows of black-and-white Holstein breed of german selection. The keeping of cows is loose-boxed in sections of 50 animals each, milking in the milking parlor at the Karusel milking machine, feeding the same year with the same type of polnoratsionnoy feed mixture, the type of diet is silage-silo. In the diet, the share of haylage is 40%, silage 17% of the total nutritional value. For the preparation of silage used green mass of galega orientalis.

As we know, because of the insufficient amount of sugar, galega orientalis in the relatively bad ensilage. In this regard, during the laying of the silage used biological preservatives “Laksil” and “Silostan”. For carrying out scientifically-economic experience, we created three trench silage: 1st - to control without preservative according to the traditional technology, the 2nd with a preservative “Laksil”, 3rd - with preservative “Silostan”. The introduction of the preservative was performed in accordance with the manufacturer's recommendations: “Laksil” at the rate of 1 liter per 15 tons, “Silostan” – 1 liter to 150 tons of green mass, dried to a moisture content of 55%.

Haylage for feeding cows began to be used two months after the laying of the trench. Rations of experimental animals were in accordance with detailed feeding standards. The composition of the diet included: hay, hay from galega orientalis, corn silage, concentrated feed, treacle, premix. The level of feeding and conditions of cows in all groups were the same. The difference was in the fact that the animals of group I (control) received the silage without preservative, II group – with bio-preservative “Laksil”, III – with bio-preservative “Silostan”.

The chemical composition of feed was determined by conventional methods. Digestibility of nutrients in the body was studied by balance experiment at 2-3 months of lactation in three animals from each group. Samples of scar fluid were taken from cows at the end of the balance experiment using a special probe before morning feeding. Determination of the chemical composition of feed, feces, urine, scar fluid, milk was carried out in the research laboratory of animal husbandry of FSBEI HE Samara State Agrarian Academy and analytical laboratory of FSBEI HE Orenburg State Agrarian University according to generally accepted methods on licensed equipment.

The results were processed by the method of variation statistics on a personal computer by G. F. Lakin (1990) using the Microsoft Office 2007 software package.

3. Results of the study
Biological preservatives added to haylaged green mass of galega orientalis have had a positive impact on the quality and nutritional value of finished feeds (table 1).
Table 1. The quality and nutritional value of haylage from Galega orientalis.

| Indicator                                      | Trench 1 (control) | Trench 2 (experimental) | Trench 3 (experimental) |
|------------------------------------------------|--------------------|-------------------------|--------------------------|
| Humidity, %                                    | 53.58              | 52.63                   | 51.89                    |
| pH                                             | 4.48               | 4.67                    | 4.73                     |
| The content of organic acids, %                | 3.96               | 4.42                    | 4.68                     |
| including lactic acetic                        | 3.14               | 3.68                    | 3.99                     |
| butyric                                        | 0.82               | 0.74                    | 0.69                     |
| Specific gravity of lactic acid to the total acid, % | 79.29              | 83.26                   | 85.25                    |
| 1 kg of haylage contains:                      |                    |                         |                          |
| dry matter, g                                  | 464                | 475                     | 481                      |
| exchange energy, MJ                            | 4.23               | 4.48                    | 4.57                     |
| Energy feed unit /EFU                          | 0.42               | 0.45                    | 0.46                     |
| feed units                                     | 0.30               | 0.33                    | 0.35                     |
| crude protein, g                               | 83.42              | 89.50                   | 92.48                    |
| digestible protein, g                          | 61.38              | 66.84                   | 69.72                    |
| crude fiber, g                                 | 138.67             | 140.53                  | 141.85                   |

Using “Laksil” ferment in the process of laying the silage, it was noted the increase in the content in finished feed dry matter and moisture reduction at 0.95%, compared to the control trench, adding the leaven of “Silostan” – on 1.69%. The process of haylage of green mass, depending on the technology of preparation of haylage, proceeded differently, which significantly affected the quality of the finished feed.

The activity of hydrogen ions in the haylage from the experimental trenches was higher than in the control, respectively, by 0.19 (4.2%) and 0.25 (5.6%). At the same time, the total content of organic acids increased by 0.46 and 0.72%, due to an increase in the lactic acid content by 0.54 and 0.85% and a decrease in the concentration of acetic acid-by 0.08 and 0.13%. Feature of Galega orientalis can be considered a full absence in the finished silage of butyric acid. As a result, the proportion of lactic acid, in relation to the total amount of organic acids, increased, respectively, by 3.97 and 5.96%.

Improving the quality of haylage with the introduction of biological preservatives led to an increase in the nutritional value of the feed. 1 kg of silage with leaven “Laksil” in comparison with the control, the dry matter content was higher at 11.0 g (2.4%), metabolizable energy – 0.25 MJ (5.9%), crude protein – by 6.08 g (7.3%), digestible protein 5.46 g (8.9%), crude fiber – by 1.86 g (1.3%); with the leaven of “Silostan”, respectively, 17.0 g (3.7%), 0.34 MJ (8.0%), 9.06 g (10.9%), 8.34 g (13.6%), 3.18 g (2.3%). Thus, the biological preparation “Silostan” showed the best results in the harvesting of silage of Galega orientalis.

When feeding haylage with a preservative to cows as part of a complete feed mixture, a positive effect on the cicatricial metabolism in animals of the experimental groups was established (Table 2).

Table 2. Indicators of scar metabolism in cows.

| Indicator                                      | Group I | Group II | Group III |
|------------------------------------------------|---------|----------|-----------|
| pH                                             | 6.10±0.15 | 6.64±0.12* | 6.85±0.13* |
| Number of bacteria, billion PCs.                | 42.67±1.32 | 49.86±1.49* | 53.24±1.67** |
| Number of infusoria, thousand in 1 ml          | 412.36±11.48 | 485.49±8.76** | 539.63±10.54*** |
| Total nitrogen, mg%                            | 102.89±3.12 | 115.46±3.45* | 117.54±3.86* |
| Protein nitrogen, mg%                          | 51.46±1.69 | 68.94±2.10** | 72.91±2.51*** |
| Non-protein nitrogen, mg%                      | 27.05±0.62 | 25.89±0.53 | 25.67±0.69 |
It is very important that as a result of reducing the acidity of the scar fluid, the pH is shifted towards the optimal indicators -6.64 – 6.85, creating favorable conditions for the microflora of the scar. The number of bacteria in 1 ml of scar fluid when feeding haylage with “Laksil” increased by 7.19 billion units (16.9 percent; P<0.05), the number of ciliates on 73.13 thousand pieces (17.7%; P<0.01), with the introduction of “Silostan” in the composition of the diet of haylage, respectively, by 10.57 billion (16.9 percent; P<0.05), the number of ciliate s on 73.13 thousand pieces (17.7%; P<0.01), with “Silostan” – by 7.24% (P<0.01).

In the process of digestion of feed, the raw protein is broken down to ammonia in the scar of the animal, which is used by the microflora for the biosynthesis of microbial protein. It is established that more intensive metabolic processes took place in the scar of cows of group III, treated in the diet of haylage with “Silostan”. The content of total nitrogen in the scar fluid was higher in comparison with animals of group I by 14.65 mg% (14.2%; P<0.05), group II – by 2.08 mg% (1.8%). Cows received haylage with “Laksil” the content of protein nitrogen was greater compared with the control group, by 17.48 mg% (34.0%; P<0.01), haylage with “Silostan” – by 21.45 mg% (41.7%; P<0.001). The content of total nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 1.16-1.38 mg% (4.5-5.4%) and 3.75-5.42 mg% (18.2-28.6%; P<0.05-0.01).

Digestion of haylage carbohydrates with preservatives was also more intense in the scar of cows. The content of volatile fatty acids (VFA) in group II was lower than in control group I, by 37 mmol/100 ml (3.8%), in group III – by 1.30 mmol/100 ml (15.2%; P<0.01). The acetic acid was predominant in the structure of volatile fatty acids, whose share was 57.73-64.97%. At the same time, the proportion of acetic acid in silage with the “Laksil” was higher compared with the control, 5.55% (P<0.05), with “Silostan” – by 7.24% (P<0.01).

The content of non-protein nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 14.65 mg% (14.2%; P<0.05), group II – by 2.08 mg% (1.8%). Cows received haylage with “Laksil” increased the number of bacteria in 1 ml of scar fluid by 7.19 billion (16.9 percent; P<0.05), the number of ciliates on 73.13 thousand pieces (17.7%; P<0.01), with “Silostan” – by 7.24% (P<0.01). The content of protein nitrogen was greater compared with the control group, by 17.48 mg% (34.0%; P<0.01), haylage with “Silostan” – by 21.45 mg% (41.7%; P<0.001). The content of total nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 1.16-1.38 mg% (4.5-5.4%) and 3.75-5.42 mg% (18.2-28.6%; P<0.05-0.01).

Digestion of haylage carbohydrates with preservatives was also more intense in the scar of cows. The content of volatile fatty acids (VFA) in group II was lower than in control group I, by 37 mmol/100 ml (3.8%), in group III – by 1.30 mmol/100 ml (15.2%; P<0.01). The acetic acid was predominant in the structure of volatile fatty acids, whose share was 57.73-64.97%. At the same time, the proportion of acetic acid in silage with the “Laksil” was higher compared with the control, 5.55% (P<0.05), with “Silostan” – by 7.24% (P<0.01). The content of non-protein nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 14.65 mg% (14.2%; P<0.05), group II – by 2.08 mg% (1.8%). Cows received haylage with “Laksil” increased the number of bacteria in 1 ml of scar fluid by 7.19 billion (16.9 percent; P<0.05), the number of ciliates on 73.13 thousand pieces (17.7%; P<0.01), with “Silostan” – by 7.24% (P<0.01). The content of protein nitrogen was greater compared with the control group, by 17.48 mg% (34.0%; P<0.01), haylage with “Silostan” – by 21.45 mg% (41.7%; P<0.001). The content of total nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 1.16-1.38 mg% (4.5-5.4%) and 3.75-5.42 mg% (18.2-28.6%; P<0.05-0.01).

Digestion of haylage carbohydrates with preservatives was also more intense in the scar of cows. The content of volatile fatty acids (VFA) in group II was lower than in control group I, by 37 mmol/100 ml (3.8%), in group III – by 1.30 mmol/100 ml (15.2%; P<0.01). The acetic acid was predominant in the structure of volatile fatty acids, whose share was 57.73-64.97%. At the same time, the proportion of acetic acid in silage with the “Laksil” was higher compared with the control, 5.55% (P<0.05), with “Silostan” – by 7.24% (P<0.01). The content of non-protein nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 14.65 mg% (14.2%; P<0.05), group II – by 2.08 mg% (1.8%). Cows received haylage with “Laksil” increased the number of bacteria in 1 ml of scar fluid by 7.19 billion (16.9 percent; P<0.05), the number of ciliates on 73.13 thousand pieces (17.7%; P<0.01), with “Silostan” – by 7.24% (P<0.01). The content of protein nitrogen was greater compared with the control group, by 17.48 mg% (34.0%; P<0.01), haylage with “Silostan” – by 21.45 mg% (41.7%; P<0.001). The content of total nitrogen and ammonia, on the contrary, was higher in the scar of cows receiving haylage without preservative, respectively, by 1.16-1.38 mg% (4.5-5.4%) and 3.75-5.42 mg% (18.2-28.6%; P<0.05-0.01).

Table 3. Digestibility of nutrients rations with silage of galega orientalis.

| Indicator            | Group I     | Group II    | Group III    |
|----------------------|-------------|-------------|--------------|
| Dry matter           | 68.76±0.54  | 73.18±0.66**| 74.65±0.59***|
| Organic matter       | 71.59±0.68  | 75.89±0.63**| 77.56±0.70** |
| Crude protein        | 72.34±0.59  | 75.63±0.44**| 76.82±0.55** |
| Crude fat            | 61.48±0.73  | 66.84±0.67**| 67.79±0.74** |
| Crude fiber          | 53.69±0.66  | 58.26±0.56**| 59.88±0.69** |
| Nitrogen-free extractives | 71.85±0.78 | 78.42±0.93**| 80.31±0.86***|

Note: **P<0.01; ***P<0.001.

Cows receiving in the ration silage with preservative “Laksil”, in comparison with the control group, is better digested dry matter of feed by 4.42% (P<0.01), organic matter at 4.30% (P<0.01), crude protein – by 3.29% (P<0.01), crude fat – by 5.36% (P<0.01), crude fiber – by 4.57% (P<0.01), Nitrogen-free extractives – by 6.57% (P<0.01). Nutrients ration with silage treated with the drug “Silostan”, digested by animals better, respectively, by 5.89% (P<0.001); 5.97% (P<0.01); 4.48% (P<0.01); 6.31% (P<0.01); 6.19% (P<0.01); 8.46% (P<0.001).
Most of the nutrients of feed the cow spends on the synthesis of milk. High nutritional content of haylage with preservatives, improving the digestibility of nutrients in the diet led to higher milk productivity of cows (table 4).

**Table 4. Milk productivity of cows.**

| Indicator                                      | I                  | II                  | III                 |
|------------------------------------------------|--------------------|---------------------|---------------------|
| Duration of lactation, days                   | 356.4±7.38         | 329.7±5.82*         | 334.1±6.25          |
| Milk yield per lactation, kg                  | 7482±138.64        | 7951±120.11*        | 8267±125.64**       |
| Milk yield for 305 days of lactation, kg      | 6957±134.26        | 7638±112.64*        | 7896±122.48**       |
| Fat mass fraction, %                          | 3.64±0.03          | 3.68±0.02           | 3.69±0.04           |
| Milk fat, kg                                  | 253.2±4.59         | 281.0±4.33*         | 291.3±4.59**        |
| Protein mass fraction, %                      | 3.01±0.02          | 3.08±0.03           | 3.10±0.04           |
| Milk protein, kg                              | 209.4±3.97         | 235.2±4.12**        | 244.7±4.33**        |
| Milk yield for 305 days of lactation in terms of basic fat and milk protein, kg | 7229±139.56        | 8067±119.47**       | 8376±123.91**       |
| Live weight of cows                           | 568.2±6.43         | 565.7±5.68          | 571.4±5.83          |
| Index milk yield, kg                          | 1272.3±21.35       | 1426.0±19.56**      | 1465.9±20.47**      |
| Milk yield in terms of 1 day of lactation, kg | 20.99±0.86         | 24.12±0.64*         | 24.74±0.72*         |

Note: *P<0.05; **P<0.01; ***P<0.001.

It was found that the duration of lactation was longer in cows of the I control group, compared with the II experimental group – by 26.7 days (8.1%; P<0.05), with III experimental – 22.3 days (6.7%).

For complete lactation from cows of the II experimental group, more milk was milked by 469 kg (6.3%; P<0.05), from cows of the III group-by 785 kg (10.5%; P<0.01), compared to the control group. For 305 days of lactation, the difference in milk yield was 681 kg (9.8%; P<0.05) and 939 kg (13.5%; P<0.01), respectively. Along with the value of milk yield, cows increased the mass fraction of fat (MFF) – in the II experimental group by 0.04%, in the III experimental group by 0.05%; the mass fraction of protein (MFP), respectively, by 0.07 and 0.09%. The yield for 305 days of lactation in terms of basic fat (3.4%) and protein (3.0%) in cows of the experimental groups was higher by 838 kg (11.6%; P<0.01) and 1147 kg (15.9%; P<0.01). In terms of milk yield per 1 day of lactation, the cows of the II experimental group exceeded the control by 3.13 kg (14.9%; P<0.05), III experimental group – by 3.75 kg (17.9%; P<0.05). The milk index in this case, in cows fed haylage with “Laksil”, was 153.7 kg more than in the control group (12.1%; P<0.01), with the drug “Silostan” –193.6 kg (15.2%; P<0.01).

One of the main factors influencing the quality of milk is the nutritional value of feed. All nutrients entering the body of the cow with feed are primarily directed to the synthesis of milk (table 5).

**Table 5. Chemical composition and physical properties of cow’s milk.**

| Indicator          | I                  | II                  | III                 |
|--------------------|--------------------|---------------------|---------------------|
| Dry matter, %      | 1189±0.07          | 12.10±0.05*         | 12.19±0.06**        |
| Mass fraction of fat, % | 3.60±0.03          | 3.64±0.02           | 3.66±0.01           |
| Mass fraction of protein, % | 2.99±0.02          | 3.05±0.01*          | 3.06±0.02*         |
| including: casein, % | 2.32±0.02          | 2.41±0.01**         | 2.45±0.01***        |
| whey protein, %    | 0.67±0.01          | 0.64±0.01*          | 0.61±0.01***        |
| Milk sugar, %      | 4.59±0.07          | 4.67±0.04           | 4.69±0.05           |
| Ash, %             | 0.71±0.02          | 0.74±0.02           | 0.78±0.02*          |
| Calcium, mg%       | 116.6±0.93         | 123.5±0.76          | 125.7±0.81          |
| Phosphorus, mg%    | 93.6±0.78          | 98.8±0.64           | 101.4±0.69          |
| pH                 | 6.63±0.10          | 6.67±0.07           | 6.69±0.08           |
The inclusion of haylage with biological preservatives in the diet of cows had a positive effect on the chemical composition of milk. The best results obtained from the use of haylage with drug “Silostan”. Compared with the control, milk of cows of II experimental group dry matter content was higher by 0.21% (P<0.05), III experimental group – by 0.30% (P<0.01); mass fraction of fat, respectively, in the groups of 0.04 and 0.06%; mass fraction of protein – by 0.06 and 0.7% (P<0.05); milk sugar content – by 0.08 and 0.1%; ash – by 0.03 and 0.07% (P<0.05). Titratable acidity of milk in the experimental groups decreased by 0.8-0.9 °Т, the number of somatic cells decreased by 37.8 thousand / cm³ (20.6%) and 41.9 thousand/cm³ (22.8%), which confirms the improvement of its quality.

### 4. Discussion of the results

*Galega orientalis* is characterized by high productivity and yield of green mass up to 750 C/ha. Plants are tall, well-foliated, sheet plates are broad, the stem is hollow, which promotes more rapid drying in the preparation of hay and silage. Unlike silage, the main preservative factor in haylage is not acidity, but “physiological dryness” of the medium, which is achieved by pre-drying of the green mass of plants to a moisture content of 50-55%. When pre-drying of plants, increases water-holding power of cells and at a humidity of 50-55%, it corresponds to 55 atm. Maximum sucking force of microorganisms, according to some scientists, is 50-52 at., that does not allow to consume the moisture of plants necessary to ensure active life and fall into the stage of antibiosis. As a result, acid formation in the haylage is sharply reduced, and the pH is 4.6-5.4. This method of preserving plant feeds provides better preservation of nutrients and primarily protein and sugar.

Biological drugs “Laksil” and “Silostan” is intended for canning hard-silage plant material of legume forage crops. The basis of the preparations is living cultures of specially isolated lactic acid bacteria of the genus *Lactobacillus*. The introduction of drugs in dried green mass haylaged cultures allows intensifying the process of lactic acid fermentation to optimize ratio of organic acids due to the increase of lactic acid by 0.54-0.85% and reduce the content of acetic acid by 0.08 to 0.13%, rationally use of reserve carbohydrates of plant raw materials and enriching the feed of biologically active substances, improving its quality and nutritional value.

The most optimal balance of organic acids in silage, achieved by adding the preservative of biological products, had a favorable effect on the microflora of the scar, enhancing livelihoods, plus the lactic acid bacteria included in the composition of the drug, who are actively involved in digestion of feed.

Once in the scar, forage is exposed to the microflora. It should be noted that the ratio of the various components of the scar content is variable and depends on the quality of feed and the structure of the diet. The increase in total and protein nitrogen content in the scar fluid indicates a more effective use of feed nitrogen, compared with the same indicators in animals of the control group. Crude protein is exposed to symbiotic microflora in the scar, splitting it to amino acid and ammonia levels. The addition of biological preparations based on a live culture of lactic acid bacteria to the haylage mass led to partial denaturation of the feed protein, which caused the “protection” of the latter from rapid decay in the scar. The increase in the amount of bacteria and protozoa in the scar resulted in better use of ammonia in the synthesis of microbial protein and increased digestibility of feed proteins in cows. The higher content of ammonia in the scar fluid of cows of the control group shows that the feed protein undergoes maximum decay under the influence of the scar microflora, which does not have time to process it into a microbial protein more accessible to the animal body. Excess ammonia, according to a number of scientists, is absorbed into the blood and excreted from the body through the kidneys in the form of urea.

| Titratable acidity, °Т | 18.4±0.33 | 17.6±0.28 | 17.5±0.28 |
|------------------------|------------|------------|------------|
| Density, g/cm³         | 28.1±0.06  | 28.5±0.04  | 28.6±0.03  |
| Somatic cells, thousand/cm³ | 183.6±12.34 | 145.8±13.22 | 141.7±10.86 |

Note: *P<0.05; **P<0.01; ***P<0.001.
Under the influence of cellulolytic bacteria and fusoria, feed carbohydrates are broken down during fermentation, with the formation of volatile fatty acids. The content of VFA in the scar of cows of control and experimental groups was within the physiological norm (6-14 mmol/100 ml). It was found that the introduction in the composition of the rations of silage with preservatives “Laksil” and “Silostan”, led to the decrease in the concentration of volatile fatty acids in scar fluid. Increasing the content of crude fiber in the haylage and increasing the pH in the scar to the optimal indicators (6.64-6.85), contributed to an increase in the structure of VFA the proportion of acetic acid. It is very important that the result of the reduction of acidity in silage with preservatives, when scar digestion decreases the secretion of butyric acid, high content of which often leads to the disease of the cows.

The quality of feed and features of scar metabolism is due to the digestibility of nutrients in diets. The high content of scar fluid of the cows receiving the ration silage with preservatives, total and protein nitrogen with a low content of ammonia, characterized by more intense digestibility crude protein and more efficient use of nitrogen compounds of feed. Despite the decrease in the scar content of cows of experimental groups of VFA, the digestibility of crude fiber and crude fat of feed in their body was significantly higher compared to the control group.

The components of milk are synthesized in the cells of the secretory epithelium of the alveoli of the udder of cows. In this part of the component goes into milk from the blood stream intact, the other part of feed nutrients is a raw material for the synthesis of essential components of milk. Therefore, the quality of feed and the ability of animals to extract from feed as much as possible in the process of digestion the necessary amount of initial elements for the synthesis of milk has a paramount importance for highly productive cows.

Increasing the nutritional value of silage of galega orientalis, the introduction in its composition of bio-preparations “Laksil” and “Silostan”, intensification metabolical processes in the scar and high digestibility of nutrients of feed served as the basis for increasing the level of milk productivity of cows. Milk yield in the experimental groups for 305 days of lactation in terms of basic fat and milk protein increased, respectively, by 11.6 and 15.9% with a high degree of confidence (P<0.01). Full-fledged feeding of cows allowed to increase the intensity of the whole body, which is characterized by an increase in milk production for every 100 kg of live weight of the animal (milk index) by 153.7-193.6 kg (12.1-15.2%), and the yield in terms of one day of lactation to increase by 14.9-17.9%.

Simultaneously with the increase in milk yield, an improvement in the quality of milk was noted. Increasing the content of total and protein nitrogen in the scar fluid in cows of experimental groups was a prerequisite for an increase in the mass fraction of protein in milk during milking by 0.06-0.07%. Improved technological characteristics of milk, due to an increase in the structure of milk proteins casein share by 1.4-2.5% and a decrease in the proportion of whey proteins, which are highly digestible in the body of human and animals, but do not coagulate under the influence of rennet ferment. The high share in the VFA scar fluid of acetic acid increased in milk of cows of the experimental groups, mass fraction of fat. Along with the chemical composition, the physical properties of milk in the milk of cows of the experimental groups improve, titratable acidity decreases by 0.8-0.9 ° T, density increases by 0.4-0.5 ° A, and the number of somatic cells decreases by 20.6-22.8 %.

5. Conclusion
The research results showed that the problem of poor haylage of the green mass of galega orientalis during the preparation of haylage, due to the low content of sugar in the composition of plants, can be successfully solved by using the bio-preservatives “Laksil” and “Silostan”, which include live cultures lactic acid bacteria of the genus Lactobacillus. Processing senescent mass with biological products improves the quality of the finished feed, increases its nutritional value. As a result, metabolic processes in the rumen are stabilized, the variability of feed nutrients is increased, and, as a result, the milk yield of cows is increased, and the quality of milk is improved.
References

[1] Khaziakhmetov F, Khabirov A, Avzalov R, Tsapalova G, Rebezov M, Tagirov Kh, Giniyatullin Sh, Ishmuratov Kh, Mishukovskaya G, Gafarova F, Yessimbekov Zh 2018 Research Journal of Pharmaceutical, Biological and Chemical Sciences 9 3 pp 866-870

[2] Khaziakhmetov F, Khabirov A, Avzalov R, Tsapalova G, Rebezov M, Tagirov Kh, Giniyatullin Sh, Ishmuratov Kh, Mishukovskaya G, Gafarova F, Esimbekov Zh 2018 Annual Research & Review in Biology 25 1 pp 1-7

[3] Mironova I, Kosilov V, Nigmatyanov A, Saifullin R, Senchenko O, Khairakhmanov E, Chernenkov E 2018 Research Journal of Pharmaceutical, Biological and Chemical Sciences 9 6 pp 18-25

[4] Tagirov Kh, Gubaidullin N, Fakhretdinov I, Khaziakhmetov F, Avzalov R, Mironova I, Iskhakov R, Zubairova L, Khabirov A, Gizatova N 2018 Journal of Engineering and Applied Sciences 13 58 pp 6597-6603

[5] Sheigratsova Z, Trofimov A 2012 Current problems of intensive development of animal husbandry Gorki pp 343-349

[6] Gaikwad S, Kulkarni A, Suranani S, Sonawane S, Jolhe R, Patil V, Bhanvase B, Pimplapure M, Potoroko I, Sonawane S 2017 Green Processing and Synthesis 16 2 pp 189-196

[7] Krasulya O, Shestakov S, Bogus V, Potoroko I, Cherepanov R, Krasulya B 2014 Ultrasonics Sonochemistry 21 6 pp 2112-2116

[8] Kan C, Meijer G 2007 Animal Feed Science and Technology 133 1-2 pp 84-108

[9] Potoroko I, Krasulia O 2013 Economics & Management Research Journal of Eurasia 1 1 pp 75-84

[10] Streit E, Schatzmayr G, Tassis P, Tzika E, Marin D, Taranu I, Tabuc C, Nicolau A, Aprodu I, Puel O, Oswald I 2012 Toxins 4 10 pp 788-809

[11] Uskova D, Uskov I 2016 Advances in Agricultural and Biological Sciences 2 2 pp 13-17

[12] Tagirov H, Vagapov F, Gizatova N 2018 News of Science and Education 1 3 pp 27-29