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SUSTENANCE, THE SAFETY OF PLANTS AND FEED OF *Galega orientalis* (Lam.)

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Abstract

Conducted a comprehensive comparative study of the nutritional and biological value Galega orientalis (Lam.): the solubility of the protein in vitro - Galega's seeds, leaves, hay, which was harvested in the phase of budding - beginning of flowering. It is believed to be the essential influence of feed type on the solubility of the protein. According to the conducted studies it has revealed that the solubility of the feed protein is in the range from 37.0% to 50.0%. The rate of solubility of Galega orientalis (Lam.) seed protein is 50.0%, litestock - 40.0%, and hay - 37.0% from its total. The research results indicate that the protein of Galega orientalis (Lam.) refers to the feed with the average level of punct solubility. It has researched qualitative assessment of the biologically active substances content in organs of Galega orientalis' (Lam.) plants. It has identified the highest content of flavonoids and saponins in rosette leaves and ascorbic acid in the organs of plants and petals. There is the high content of tannins found in the petals of Galega orientalis (Lam.). There is a high content of coumarins and water-soluble polysaccharides in the roots of the studied plants. Phytochemical studies of the plant Galega orientalis (Lam.) indicates the absence in it of cardiac glycosides and antrahlikozydiv. It was first conducted testing on antimicrobial activity of a plant Galega orientalis (Lam.) on the growth pure cultural of bacteria Gram-positive (Micrococcus luteus), Gram-negative (Escherichia coli XL1, DH5) and yeasts (Saccharomyces cerevisiae W303). The material for the study was dried vegetative mass Galega orientalis (Lam.) in the phase of budding and early flowering. As a result of the experiment was revealed that 20% concentration of aqueous extract of this plant had inhibitory effects on the growth of pure cultures of bacteria and yeast. It has grounded reasonably possible relationship between the antimicrobial activity of the extract of this plant and the lack of bloating in cows. It has outlined prospects of further researches of this problem.

Key words*: Galega orientalis (Lam.), organs of plants, fodders, splitting in the rumen, protein solubility, biologically active substances, antimicrobial activity.*

INTODUCTION

A comprehensive approach to the definition of nutritive and biological value of plants and forage provides an opportunity to reveal their influence on the functioning of the organism and productivity of animals (Darmohray, 2009). After all, feeding is the axis around which revolves everything that gives the possibility of implementation of modern genetic potential of the animals.

An important factor that must be considered in formulating rations for animals is the establishment of the content in feed and availability of biologically active substances in the process of exchanging (Darmohray, 2009). For ruminants it is also necessary to know the degree of splitting of fodder protein in the rumen. One of the indicators that is used to predict the extent of splitting of fodder protein in the rumen is its solubility. Solubility and razmalyvanie crude protein of forages in most cases closely correlated (Yanovuch and Solohub, 2000).

Today in the scientific world continues to search for new and more stable strong components of antimicrobial action of natural origin in contrast to the existing synthetic antibiotics and improvement of microbiological purity of food products, feed additives (Zamaziy, 2004). According to the publication of domestic and foreign authors there is a

considerable interest to study the antimicrobial activity of non-traditional but promising agricultural crops, one of which is *Galega orientalis* (Lam.), which belongs to perennial legumes (Darmohray and Orishchuk, 2019). Using of natural substances that have antimicrobial action, is quite important given several things: the micro-organisms have no resistance to them and perhaps long-term use; do not cause harmful (adverse) impact on human and animal; thanks to its braking effect on the unwanted microflora can be applied in the food industry, because food processing not allowed to use synthetic antibiotics (with the exception of the peptide antibiotic Nisin) (Cyupko, 1999).

Therefore, the study of questions of versatile nutritional and biological value of feed remains relevant.

One of the ways to improve the food supply for animals, finding natural plant antibiotics for humanity is to search for new, non-traditional, high-yielding, alternative crops. The main source of promising, non-traditional, alternative crops is the natural flora. However, the introduction of these plants into culture, compared with traditional species, requires testing, studying the impact on the functioning of the animal body, their productivity, product quality, and establishing a productive action in specific conditions (Darmohray, 2012).

According to reports of national and foreign authors, research on the versatile nutritional value of alternative plants, in particular *Galega orientalis* (Lam.), indicates quite significant opportunities in the biotechnological process of feed production, animal nutrition, nutritiology and the food industry (Darmohray, 2017).

To sum up, the study of the diverse nutritional and biological value, safety of the *Galega orientalis* (Lam.) plant, feed from It and their impact on the functional and productive indicators of animals, antimicrobial activity is relevant (Irobi, 1994).

MATERIALS AND METHODS

Chemical composition and nutritional studies were conducted in the laboratories of the departments of animal feeding of the Lviv National University of Veterinary Medicine and Biotechnology named after S.S. Grzycki and the Department of Animal Nutrition of the Kollontai Agricultural University of Cracow (Poland).

Average samples of green mass and feed were taken in accordance with generally accepted methods the protein solubility of feed was determined in vitro in a buffer solution $(NH_4)_2SO_4$ (pH = 6.5) according to the methods described in the methodical instructions VNIIFB and PZ (Borovsk, 1987). In a conical flask for 250 ml, crushed feed was placed in an air-dry state in an amount equivalent to 50 mg of nitrogen and 200 ml of buffer solution heated to 40°C was added. After 60 minutes of incubation in a thermostat, the contents of the cone were filtered and the nitrogen content in 50 ml of filtrate was determined by Kjeldahl. When calculating the solubility of raw protein, the amount of raw protein that passed into the solution and the amount of raw protein in the feed suspension before incubation were taken into account.

For a more complete characterization of non-traditional, rare, forage culture-Galega, we conducted a phytochemical study of vegetative and generative organs in order to determine the presence of biologically active substances in them (qualitative assessment) according to the method of N.I. Grinkevich (Grinkevich, 1983). The raw materials for analysis were leaves of rosettes of shoots, stem leaves, flower petals of generative shoots in the flowering phase and roots. The following solvents were used for extraction: water, 1% hydrochloric acid solution and 70% ethyl alcohol.

Determination of alkaloids was carried out in a water-containing extract using reagents of Dragendorff, Bouchard, Major, Sonnenstein, a solution of tannin and picric acid. In water extracts from plant organs of the studied material showed saponins reactions zanotowano and Fountain-Kendal; antraglikozidy response of the Church; tannins reaction with a solution saltamontes the braid, water-soluble polikarov - reaction with 96%, ethanol and ascorbic acid reaction with 2.6-dichlorphenolindophenol.

In the alcohol extract, cardiac glycosides were detected by the balier, Liebermann-Burhard and Keller-Killiani reactions, flavonoids - cyanides by a new test and reaction with heavy

metal salts, coumarins-by a reaction with diazoline salts and a lactone test.

The nutritional and productive value of green mass, hay and haylage from *Galega orientalis* was determined using generally recognized methods of zootechnical analysis and units of the French system INRA-88. In this system, the traditional concept of a feed unit is laid down, which is expressed in energy units: milk production (feed unit of milk) (FuM) and live weight gain (feed unit of growth) (FuG). These feed units are calculated based on the amount of net energy per 1 kg of standard barley grain.

A feed unit of milk (FuM) is the amount of net milk energy that is derived from 1 kg of standard barley grain as a productive feed that a cow consumes during lactation. One Kom corresponds to 1700 kcal - this amount of energy can be released with milk or stored in the body as a reserve in the form of fat. **The feed unit of growth (FuG)** is the amount of net energy of the live weight of the increment, which is obtained from 1 kg of standard barley grain, as a feed for the vital activity of the body of fattening young animals. This FuG is equal to 1820 kcal.

The content of amino acids in feed was determined using the INGOS AAA-400 analyzer.

Testing possible antimicrobial action galegov East on the growth of pure cultures of bacteria gram-positive (*Micrococcus luteus*), gram-negative (*Escherichia coli* XL1, DH5) and yeast (*Saccharomyces cerevisiae* W303) was held at the Institute of Cell Biology NAS of Ukraine, Department of Analytical Biotechnology (Darmohray, 2018).

The material for the study of testing antimicrobial properties of aqueous extract of this plant served as the dried vegetative mass of plants in phases of budding and beginning of flowering. In the experiments used the Endo agar for the growth of Gram-negative bacteria and LB medium for the growth of both Gram-positive and Gram-negative bacteria, and wort-agar for yeast (Darmohray and Gonchar, 2015).

It was prepared 10% and 20% extract of the preparation (dried herb) by boiling and maceration for 10-15 hours. The extracts were sterilized by cold filtration. After that, on the surface of the cups with agaritine environment was applied in 0.1 ml of the investigated extract and sowed her grass proper culture. All the experiments were performed in 10 control and 10 experimental cups. We analyzed the appearance of the colonies for 2-3 days after seeding at 30ºC (yeast) and the first day at 35 to 37ºC (bacteria), comparing experimental variants with the control (without extract).

Obtained in experiments digital data processed biometrico using computer programs in MS Office 2003 program "Statistica". The results of mean values was considered statistically significant *-P<0.05, **-P<0.01, ***-P<0.001.

RESULTS AND DISCUSSIONS

Nutritional and biological value, safety of plants and feed from *Galega orientalis* (Lam.)

Nutritional and biological value of plants and feed with *Galega orientalis* (Lam.) in the INRA-88 system

The search for new methods and approaches to study the nutritional value of feed, as well as the features of rationing feeding of animals of different species and the direction of productivity makes it possible to significantly increase the efficiency of feed use. To achieve genetically determined productivity of animals, it is necessary to study the nature of biochemical and physiological relationships, starting with the chemical composition of plants, their consumption, transformation of nutrients, energy metabolism and the effectiveness of their use for biosynthesis of products. It is noteworthy that the system of evaluation of nutritional value of forages for ruminants INRA-88. Because it involves simultaneously determining the nutritional value of feed and establishing the need for it for animals and rationing feeding. The advantages of this system for assessing the nutritional value of feed and rationing animal feeding are that the energy content, expressed in net energy, in feed units for dairy cows and live weight gain of animals. The estimation of feed nutrition in the INRA-88 system, which was developed in France, is very successful and practical, so it is used by many European countries. This nutritional assessment of feed is based on three common and interrelated ruminant nutrition systems: energy (net energy), protein, and the ability to consume

feed and create volume in the rumen. The nutritional and energy value of feed is summarized in tables and expressed separately for feed units of milk production and live weight gain of 1 kg of feed or dry matter.

The aim of the study was to determine the nutritional value of green mass, hay and haylage from *Galega orientalis* in the INRA-88 system, which differs from other systems and is a priority in Europe.

Based on the conducted research, it was found that *Galega orientalis* (Lam.) is characterized by a high content of raw protein in all phases of vegetation development and can be used as an alternative food for feeding and feeding ruminant and monogastric animals (Table 1).

As found out by the results of research, the highest content of Galega protein was found in the stalk phase of 24.85%. As the plant develops, the amount of raw protein decreases slightly and reaches a minimum value of 17.63% during the pod formation phase. The content of crude protein in various phenological phases was within these limits (24.85-17.63%). A similar pattern is observed for the content of crude fat (3.60-2.91%) and crude ash (5.86-4.95%). At the same time, there is an increase in crude fiber (24.09-28.59%) and its neutral-divergent fraction (54.4-69.39%).

Table 1. Chemical composition of *Galega orientalis* (Lam.) in different phenological phases (% dry matter)

Indicator	Phase of development			
	beginning of budding (stemming)	buddings	beginning of flowering	pod formations
Crude protein	24.85±1.64	20.53±1.19	20.09±1.49	17.63±0.79
Crude fiber	24.09±1.10	26.36±2.15	27.29±1.89	28.59±2.09
The fraction of the NIR	54.41±2.69	59.29±1.89	60.56±1.56	69.39±2.41
Crude fat	3.60±0.31	3.31±0.15	2.95±0.18	2.91±0.16
Raw ash	5.96±0.65	5.79±0.45	5.18±0.41	4.95±0.66

The processes of digestion and fermentation of macro-living substances of feed in the pre-pancreas of ruminants is an important stage to ensure the effective use of these substances and energy of the body. The degree of cleavage, the amount of degradation and its digestibility in General largely depends on the chemical composition of the feed and its energy and protein value.

The nutritional value of hay and haylage depends on the quality of the green mass, the vegetation phase, compliance with the technique and technology of their preparation (Table 2).

Table 2. Chemical composition of feed from *Galega orientalis* (Lam.), %

Indicator	Food		
	hay	haylage	green mass
Dry substance	77.0	46.50	15.90
Organic matter	71.85	27.67	14.60
Crude protein	13.56	6.20	3.40
Crude fat	1.66	1.10	0.51
REM	27.15	13.10	6.19
Crude fiber	29.46	21.80	4.50
Fraction of fiber:			
NIR	57.70	69.40	58.30
The FTC	41.40	58.90	42.00

Analyzing the data given in Table 2, it should be noted that the feed from *Galega orientalis* (Lam.) is characterized by a high content of dry and organic substances, and especially raw protein. Thus, the dry matter content in the hay is 77.0%, in the haylage -46.5%, and in the green mass -15.9%. The highest content of dry and organic substances is found in hay, and the lowest content of dry and organic substances is found in the green mass.

A similar pattern is observed for the content of raw protein, so in the hay this indicator is 13.56%, in the haylage 6.20% and in the green mass-3.4% in terms of the natural humidity of the studied feed.

In terms of raw fat content, hay exceeds the green mass by three times. So, in the hay its content is 1.66%, in the haylage - 1.1% and in the green mass - 0.51%.

According to the content of BER, hay from *Galega orientalis* has the highest index (27.15%), haylage contains 13.10%, respectively, the green mass - 6.19%. The studied indicators increase in hay and haylage due to the fact that the concentration of dry matter increases, and the water content decreases.

As for the content of raw fiber, it is 29.46% in the hay, 21.8% in the haylage and 4.5% in the green mass. Of the fiber fractions, the dominant position is occupied by NDC (57.70 - 69.40%, respectively). The next largest is the KDC fraction (41.4-58.9). The highest content of

acidic lignin was observed in the haylage (18.4%).

The nutritional value of the same feed in the INRA-88 system is not the same for different technological indicators (Table 3).

According to the analysis of digital material, which is shown in Table 2, we see that the energy of feed from *Galega* East is better transformed into milk, because the Kop is lower compared to the FuM. So, in the hay, this indicator is lower by 12.1%, in the hay - 11.1%, and in the green mass by 6.3%, respectively. It should also be noted that LFA is converted to fat and milk protein faster than it is converted to meat tissue.

Table 3. Nutritional value of *Galega orientalis* (Lam.) feeds in the INRA-88 system for ruminants

The feed title	Energy		Protein (protein)		Volume feed units and capacity feed consumption, kg		
	FuM	FuG	EPSI (N), g	EPSI (E), g	SVFU (sheep)	SVFU (cow)	SVFU (cattle)
Hay	0.58	0.51	87.0	71.0	0.87	0.74	0.72
Hay lage	0.36	0.32	26.0	17.0	0.48	0.40	0.50
Green mass	0.16	0.15	21.0	17.0	0.13	0.15	0.14

To determine the protein (protein) nutritional value of feed, you need to know the content of raw protein, the coefficient of protein breakdown in ruminants in situ and the coefficient of digestibility of organic mass fermented in the rumen. In the French system, the protein value of the feed is expressed by two indicators: **the excess protein in the small intestine depending on the amount of nitrogen input (EPSI (N))**, cleaved or not cleaved in the rumen, and the **excess protein in the small intestine depending on the amount of energy input (EPSI (E))**. So, EPSI (N) shows the maximum amount of protein that is digested in the small intestine, provided that all the protein that has broken down in the rumen is assimilated by microorganisms, and EPSI (E) is equal to the amount of protein that is digested in the small intestine at maximum energy use, which is fermented in the rumen to synthesize microbial protein. The need of animals is expressed by the amount of protein that is digested in the small intestine. If EPSI (E) more than EPSI (N) then you need to include non-protein nitrogenous substances in the diet to increase EPSI (N). If the EPSI (N) is higher, then the diet should include protein sources that are difficult to break down or use easily fermentable carbohydrates.

The system of volumetric feed units (SVFU) and the ability to consume feed in the norms of animal feeding at different rates of productivity depends on the content of dry matter in the feed, as well as on the ability to consume feed (ACF) animals (kg). However, the amount of dry matter is an insufficient criterion for evaluating the consumption of bulk feed, given that they have different quality. For example, wheat straw and young grass pastures. The animal is better and more likely to eat the dry matter of grass pastures than straw.

Therefore, the French system introduced the terms of consumption of dry substances and units for creating the volume of feed, which are expressed in volumetric feed units. The volume cost of feed for ruminants also includes the composition and structure of plants that are included in the dry matter of the feed (the size of the cell walls and the degree of coarsening).

The basis for determining the content of bulk feed units is the so-called ”comparative feed-pasture grass” with a dry matter content of 15.0% raw protein, 25.0% raw fiber. The digestibility of organic matter is 77.0%, the energy value (energy content) is 0.95 FuG per 1 kg. The consumption of dry substances of this feed is estimated for standard animals and is respectively: for sheep - 75 g, cattle - 95 g and cows - 140 g of dry substances per 1 kg of live body weight - 0.75 EM. It should be noted that 1 kg of dry matter "comparative feed" has a volume value equal to 1 volume of **feed unit for sheep (SVFU sheep), livestock - (SVFU cattle) and cows (SVFU cow).** It is advisable to emphasize that when determining the volume of feed units, there is an interdependence between the chemical composition of grass in the vegetation phases and their volume value.

The ability to consume feed per ACF for "standard" animals is: for sheep - 1.62 kg, growing fattening young cattle - 8.5 kg and cows - 17.0 kg.

This assessment of the nutritional value of ruminant feed in the INRA-88 system is progressive and successful, since it takes into account many factors, factors and is closely related to the composition and properties of feed, metabolism and energy.

The feed value of the same feed, even for ruminants, is different and depends on the direction of productivity.

The concept of the French system for determining the nutritional content of feed INRA-88 and rationing ruminant feeding is based on three interrelated subsystems: energy, protein and the ability to consume feed and create volume in the rumen, and this creates opportunities for a versatile assessment of nutritional value.

Modern approaches to the normalization of protein nutrition in ruminants are based on determining the nitrogen requirements for rumen and host microorganisms. Rumen symbiotic microorganisms use non-protein forms of nitrogen and easily accessible protein structures for their growth. The intake and absorption of amino acids in the small intestine of ruminants, which depends on the amount of microbial protein and non-cleaved rumen protein feed, determines the level of protein nutrition.

The solubility of protein and quality indicators of nutritional value of forages with *Galega orientalis* (Lam.)

An important factor to consider when preparing diets for animals with a multicameral stomach is the degree of protein breakdown of feed in the rumen. One of the indicators that is used to predict the degree of breakdown of feed protein in the rumen is its solubility. The material for the study of solubility of protein were: seeds, leaves and hay from *Galega orientalis* (Lam.). The solubility of protein was determined *in vitro* in a buffer solution $(NH_4)_2SO_4$ (pH = 6.5). Calculating the solubility of crude protein was considered the amount of crude protein, which is passed into the solution and the amount of crude protein in feed to incubation. Nitrogen content was determined by Keldahl.

The results of researches on determination of solubility of protein feed of different origin are shown in Figure 1. According to the conducted laboratory studies were determined a significant influence of the type of food and organs of plants on the degree of solubility of the protein.

Data are given on the figure indicate the dependence of the index of solubility of protein from the morphological structure and origin of feed. The solubility of protein of study forages ranges from 37.0% to 50.0%. The difference is caused by the structure and chemical composition of forages.

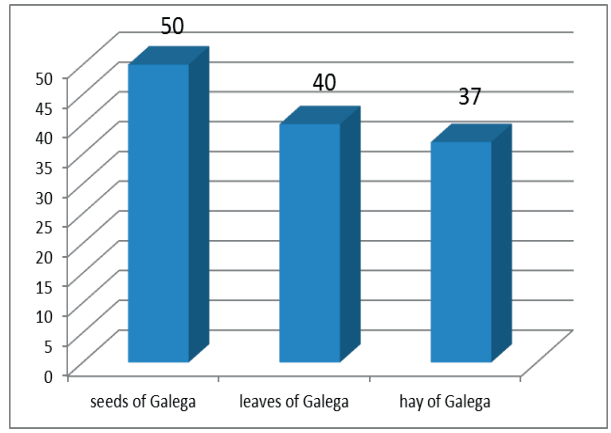

Figure 1. Solubility of fodder protein, %

The index of protein solubility for hay from *Galega orientalis* (Lam.) is higher than gluten five times. The protein of leaflets of *Galega orientalis* (Lam.) dissolved in buffer solution rather than protein hay. This is probably due to the hardening the stem and formation the slightly soluble fiber complexes and nitrogen compounds. The protein seed *Galega orientalis* (Lam.) dissolved in 50.0% of its total. It is a lower solubility compared to the solubility of protein of soy, despite the fact that these foods have the same high protein content. This may be the amino acid composition of protein, namely the content of branched amino acids, which affect the number of the indices.

Fodder and medicinal properties of plants depend on the presence of different chemical structure and productive action of substances. The most important of these substances are alkaloids, glycosides, saponins, tanning agents, flavonoids, essential oils, plant hormones, vitamins, trace elements, organic acids, mineral salts, resins and other.

For a more complete characterization of alternative and rare crop *Galega orientalis* (Lam.) we have conducted research for determination of some biologically active substances in the bodies of plants it was performed according to the method of M.I. Grinkevich (1983). Qualitative assessment of the content of the BAS in the bodies of plants *Galega orientalis* (Lam.) is presented in Table 4.

Table 4. Content of biologically active substances in the bodies of plants *Galega orientalis* (Lam.)

BAS	Organs of plant			
	rosette leaves	Roots	stem leaves	petals
Alkaloids	++	N	-	-
Coumarins	++	+++	++	++
Flavonoids	+++	++	++	++
Heart glycosides	-	-	-	-
Saponins	+++	++	++	++
Tannins	++	++	++	+++
Anthraglycosides	-	-	-	-
Water-soluble polysaccharides	++	+++	++	++
Ascorbic acid	+++	+	++	+++

Legend: +++ - the high content of the BAS; ++ - the sufficient level; + - low (traces); N – the content is not determined.

This plant is a typical bean plant. Alkaloids are available only in the rosette leaves (++) a sufficient content. Qualitative assessment shows that this plant is a high content of coumarins, especially in the roots. In this culture is the high content of flavonoids, especially in the rosette leaves, tanning agent petals and water-soluble polysaccharides is in the roots. It should be noted that in *Galega orientalis* (Lam.) no shows qualitative assessment, heart glycosides and anthraglycosids.

Separately it is necessary to emphasize about the high content of ascorbic acid in the leaves and petals except roots.

By chemical and physiological properties, synage occupies an intermediate place between silage and hay.

It is known that the biological value of protein depends on the amount and ratio of amino acids in the feed or diet. Performing plastic functions, amino acids support the redox potential, and their content and ratio indicates that the body is provided with high-quality protein. In terms of amino acid content of feed from *Galega orientalis* (Lam.), especially its green mass exceeds the standard of the **FAO (Food and Agriculture Organization of the United Nations)**.

The amino acid content of the studied feed is shown in Table 5.

According to the data of the table material, it should be noted that there are certain fluctuations in the indicators of amino acid nutrition of the studied feeds.

Table 5. Amino acid nutrition of *Galega orientalis* (Lam.) feed (g/kg)

Aminoacid	Green mass	Silage	Hay	Amino acid	Green mass	Silage	Hay
Aspartic acid + asparagine	12.11	13.57	2.31	Leucine	6.89	9.46	1.91
Threonine	3.58	3.48	0.74	Tyrosine	2.91	2.69	0.59
Serine	4.25	2.09	0.47	Phenyl-alanine	5.32	5.96	3.01
Glutamic + glutamine	9.17	11.34	2.35	Histidine	2.29	3.53	0.97
Proline	4.80	10.55	0.21	Lysine	4.95	5.87	1.30
Glycine	4.26	6.28	0.16	Arginine	4.87	5.62	1.11
Alanine	5.08	3.83	0.78	Cystine	1.03	1.56	0.45
Isoleucine	4.27	5.89	1.22	Methionine	2.09	1.49	0.29
Valine	4.85	7.42	1.58				

The content of aspartic amino acid in the green mass is 12.11 g, in the haylage - 13.57 g, in the hay, respectively - 2.31 g. According to the content of treoninu, there is no significant difference between the green mass and the haylage, and in the hay this indicator was less than almost 5 times. In terms of serine content, the green mass exceeds the haylage by two times, and the hay by nine times. The content of glutamic amino acid was also studied. In the green mass, it was 9.17 g, in the haylage - 11.34 g, in the hay - 2.35 g in each kilogram of feed. The highest content of Proline was found in haylage from Eastern *Galega* (10.55 g), and the lowest content of this amino acid was found in hay (0.21 g). For the content of glycine, the haylage from *Galega orientalis* has a high indicator and is 6.28 g, in the green mass - 4.26 g and in the hay, respectively - 0.16 g. The green mass of the studied culture had the highest content of alanine (5.08 g), in the haylage-3.83 g, in the hay, respectively - 0.78 g. The studied feed contains a relatively high content of branched chain amino acids (valine, leucine and isoleucine). The highest total content is recorded in the haylage - 22.77 g, slightly lower content of these amino acids is available in the green mass - 16.01 g, respectively, the lowest content in the hay - 4.71 g.

According to the content of tyrosine, there was no significant difference between the green mass and the haylage, and in the hay this indicator was 0.59 g. The content of phenylalanine in the green mass and haylage was almost the same (5.32 and 5.96 g), and in the hay, respectively, 3.01 g. The analysis shows that the highest content of histidine was found in the haylage - 3.53 g, the lowest content in the hay - 0.97, and in the green mass, respectively, 2.29 g. As for the main limiting critical amino acid lysine, most of it is contained

in haylage from *Galega orientalis* (5.87 g), in the green mass - 4.95 g and in hay - 1.30 g. The high content of arginine in the green mass and haylage from this crop (4.87 and 5.62 g) was also noted. The amount of cystine and methionine in the haylage and hay from *Galega orientalis* were almost identical, and in the green mass, the amount of methionine was twice the amount of cystine.

Of the eight essential amino acids, the predominant amount is in the green mass and haylage from *Galega orientalis*. It was found that the studied feeds are relatively rich in such amino acids: aspartic, glutamic, alanine, valine, leucine, phenylalanine, arginine, and lysine. Feed contains a high content of hydrophobic branched chain amino acids, especially in the green mass.

Testing the antimicrobial activity of *Galega orientalis* (Lam.) *in vitro*

In the previous stages of our research it was established and noted in publications that grazing cows on pasture with *Galega orientalis* (Lam.) in the dew or in the rain at one of the cows did not this was caused considering the fact that this culture belongs to the legumes. With the aim of finding the possible mechanisms of this phenomenon, we performed model microbiological studies. Because research on the symbiotic microflora of the rumen is a complex problem, we studied the effect of different concentrations of aqueous extracts of *Galega orientalis* (Lam.) on growth of pure cultures of bacteria and yeast. The search for new antimicrobial agents, including those of natural origin, has become increasingly urgent in recent years, since improving the microbiological purity of food, feed additives and veterinary drugs is currently one of the top priorities of scientists and manufacturers.

The purpose of this study was to test the possible antimicrobial action of *Galega orientalis* on the growth of pure cultures of gram-positive (*Micrococcus luteus*), Gram-negative (*Escherichia coli* XL1, DH5) and yeast (*Saccharomyces cerevisiae* W303) bacteria against the background of different concentrations of water extract of this plant.

As a result of the experiment, it was observed that the preparation of the studied culture at a concentration of 10.0% (in terms of the initial mass of the dried plant) had virtually no effect on the growth of bacteria and yeast.

When increasing the concentration of the drug to 20.0 %, an inhibitory effect on the growth of *E. coli* bacteria of the XL1 and DH5 strains was found. The results of testing the antimicrobial activity of the studied drug are shown in Table 6.

Table 6. Growth of pure cultures of bacteria and yeast against the background of the action of *Galega orientalis* extract (M ± m, n = 10), number of colonies per Petri dish

Group	Gram-negative		Gram-positive	Yeast
	E. coli (XL1)	*E. coli (DH 5)*	*M. luteus*	*S. cerevisiae (W 303)*
Control	540±15	389±4	1921±81	59±5
Experience	430±9***	272±6***	1694±8*	41±4**

It was noticed that examining culture products in concentration 10% did not influence the growth of bacteria Gram-positive, Gram-negative, yeasts much. Due to increasing in concentration of water extract up to 20% found that Petri dish control group was grown at 540 ± 15 colonies of *E. coli* strain XL1 and experienced with the addition of 20% of the preparation *Galega orientalis* (Lam.) there were 110 colonies less. Therefore, it was observed inhibition of growth of bacteria by 20.0% ($P<0.001$) compared to the control cups. Intergroup difference in this indicator is statistically probable. The test results of the antimicrobial activity of the test preparation is shown in Table 6.

In the study of antimicrobial action of 20.0% water extract of *Galega orientalis* (Lam.) on the growth of gram-negative bacteria E. coli strain DH 5 it was found that in the experimental cups were 117 smaller colonies than the control. In percentage terms this means inhibition of bacterial growth by 30.0% ($P<0.001$).

It was conducted microbiological studies indicate that was slightly less antibacterial activity of an investigational preparation against Gram-positive bacteria *M. luteus*. It was found that 20% of water extract of *Galega orientalis* (Lam.) inhibits the growth of microorganisms by 12.0% ($P<0.05$) compared with control. It has showed the negative effect of water extract of *Galega orientalis* (Lam.) on

the growth eukariotic microorganisms-yeast saccharomyces cerevisiae strain W303. It was found that in the experimental cups the number of colonies was 30.5% ($P<0.01$) compared with the control.

Along the way, to note that in all cases, experimental studies of the addition of the drug *Galega orientalis* (Lam.) was not altered colony morphology strains tested.

CONCLUSIONS

Based on the results of gluten refers to feed with low solubility, protein *Galega orientalis* (Lam.) is middle, soybean and sunflower meal are with a high degree of solubility of the protein. In this regard, the feeding of ruminant animals studied fodder needs adequate amounts of protein will differently affect the efficiency of the use of nitrogenous compounds.

The analysis argues that the protein seeds, leaves and hay from *Galega orientalis* (Lam.) have an average degree of solubility. It has studied the essential influence of type of feed on the degree of protein solubility. The highest solubility has found in seeds - 50, 0%, the letter - 40.0%, and lowest in the manger - 37.0%.

The nutritional value of feed with *Galega orientalis* (Lam.) (green mass, hay, haylage) in the French INRA-88 system for ruminants was determined. The application of this assessment of feed nutrition simultaneously characterizes the energy, protein value and the amount of feed consumption. Feed from *Galega orientalis* differ in energy value for the production of milk (FuM) and meat, since FuM is higher in comparison with FuG in all the studied feeds. In the hay, the FuG is 12.1% lower than the com, in the haylage by 11.1%, and in the green mass by 6.3%. Based on our research, we claim that the energy of feed from *Galega orientalis* is better transformed for the synthesis of milk than into muscle tissue.

The studied feeds with *Galega orientalis* (Lam.) have the highest index of digestible protein in the small intestine depending on the amount of nitrogen intake (EPSI (N)), since in the green mass it is 21.0 g, in the hay - 87.0 g and in the haylage - 26.0 g, and the excess protein in the small intestine depending on the amount of energy intake (EPSI (E)), respectively, 17.0; 71.0; 17.0 (g/kg).

It was found that in comparison with other legumes, the protein of feed from *Galega orientalis* is more rich in branched chain amino acids: green mass - 16.01, haylage - 22.77, hay - 4.71 g/kg.

According to the conducted phytochemical research found that in the bodies of plants *Galega orientalis* (Lam.) is a sufficient level of alkaloids and coumarins in the rosette leaves (++), as well as the relatively high content of flavonoids in the rosette leaves and ascorbic acid in the petals and leaves the investigated plants. On the content of the BAS, this plant is characteristic bean plant. It is expedient to conduct more extensive research using modern methods and techniques to better understand and address this issue.

Obtained results allow to note a slight antimicrobial effect of a 20% water extract of *Galega orientalis* (Lam.) on growth of pure cultures of gram-negative and gram-positive bacteria and yeast. This fact can be used in the food industry as an antimicrobial agent of natural origin to preserve and ensure the microbiological purity of the products, and suggests that the lack of this was caused from animals who were fed this plant, may be associated with the inhibition of microorganisms.

Prospects for further research. It is advisable to carry out extensive research using modern methods and techniques for deeper understanding and solution of this issue and also to expand the range of test-cultures and the range of concentrations of the studied drug with respect to determine the problem.

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