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SOLUBILITY STUDIES OF PROTEIN FEED OF DIFFERENT ORIGIN AND CONTENT OF BIOLOGICALLY ACTIVE SUBSTANCES *IN VITRO*

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Comparative studies of the solubility of protein feed of different origin had been conducted. Significant influences of the type of food on the degree of solubility of the protein were determined. Qualitative assessment of the content of biologically active substances (BAS) in the bodies of plants of Galega orientalis (Lam) was investigated. It was found a high content of flavonoids, alkaloids, ascorbic acid in the bodies of plants. It was traced the outlooks of further research of this problem.

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

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.

An important factor that should be considered in the preparation of rations for poly-gastric animal is the degree of splitting protein forages in the rumen. One of the indicators used to predict the degree of splitting protein forages in the rumen is its solubility. Solubility and splitting of crude protein feed in most cases is closely correlated with each other.

The assessment of nutritional and biological value of forage remains relevant.

The aim of our study was to determine and compare the solubility of protein of different forages such as wheat, soybean, sunflower meal, gluten free, seeds, leaves and hay of *Galega orientalis (Lam)*. The solubility of forages was determined *in vitro* in buffer solution.

Materials and methods. Materials for study were: wheat, soybean, sunflower meal, gluten, seeds, leaves and hay and green mass of *Galega orientalis (Lam)* (the beginning of flowering). Solubility of protein feed was determined *in vitro* in a buffer solution of $(NH4)_2 SO_4$ (pH=6, 5). When it was calculating the solubility of crude protein and takes into account the amount of crude protein, which moved into the solution and the amount of crude protein in plate of fodder for incubation. The nitrogen content was determined by kjeldahl. Phytochemical research (qualitative assessment) content BAS in the bodies of plants *Galega orientalis (Lam)* were conducted according to the methodology of M.I. Grinkevich (1983) [4].

Results and discussion. The results of researches on determination of solubility of protein feed of different origin are shown in table 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 7.4% to 69.0%. The difference is caused by the structure and chemical composition of forages. Low soluble characterized proteins with additional bisulfide ties between amino acids. Difficultly biodegradable include blood proteins flour and gluten and some other feeds. The data are consistent with the literature about the low solubility of gluten. The index of protein

Table 1. **Solubility of fodder protein,** *%*

Fodder	Solubility of protein, %
Seeds of *Galega orientalis (Lam)*	50.0
Leaves of *Galega orientalis (Lam)*	40.0
Hay of *Galega orientalis (Lam)*	37.0
Gluten	7.4
Soybean	66.0
Sunflower meal	69.0
Wheat	57.0

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. The solubility of protein of sunflower meal is the highest among the studied feed and is 69.0%. Nitrogen compounds of wheat dissolved in buffer solution at 57.0%. The lower level of nitrogen splitting grasses compared with legumes is associated with a different mechanism of carbon fixation.

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. Qualitative assessment of the content of the BAS in the bodies of plants *Galega orientalis (Lam.)* is presented in table 2.

This plant is a typical bean plant. Alkaloids are

Table 2. **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.

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.

Conclusions and prospects for research.

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%.

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.

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ИССЛЕДОВАНИЯ РАСТВОРИМОСТИ БЕЛКОВЫХ КОРМОВ РАЗЛИЧНОГО ПРОИСХОЖДЕНИЯ И СОДЕРЖАНИЕ БИОЛОГИЧЕСКИ АКТИВНЫХ ВЕЩЕСТВ *IN VITRO*

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Были проведены сравнительные исследования растворимости белка кормов различного происхождения. Определено значительное влияние типа кормления на степень растворимости белка. Исследована качественная оценка содержания биологически активных веществ (БАВ) в частях растения "Козлятник восточный". Было определено высокое содержание флавоноидов, алкалоидов, аскорбиновой кислоты в частях растений. Также были определены перспективы дальнейших исследований этой проблемы.

Ключевые слова: *корма, разделение в рубце, растворимость белков, биологически активные вещества, Козлятник восточный, растения.*

ДОСЛІДЖЕННЯ РОЗЧИННОСТІ БІЛКОВИХ КОРМІВ РІЗНОГО ПОХОДЖЕННЯ ТА ВМІСТ БІОЛОГІЧНО АКТИВНИХ РЕЧОВИН *IN VITRO*

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Були проведені порівняльні дослідження розчинності білку кормів різного походження. Було визначено значний вплив типу годівлі на ступінь розчинності білку. Досліджена якісна оцінка вмісту біологічно активних речовин (БАР) в частинах рослини "Козлятник східний". Було визначено високий вміст флавоноїдів, алкалоїдів, аскорбінової кислоти в частинах рослин. Також були визначені перспективи подальших досліджень цієї проблеми.

Ключові слова: *корми, розділення в рубці, розчинність білків, біологічно активні речовини, Козлятник східний, рослини.*