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THE NUTRITIONAL VALUE OF FEED FROM ALFALFA-CEREAL GRASS MIXTURES DEPENDS ON THE TECHNOLOGICAL FEATURES OF GROWING

Abstract.

The results of studies on the influence of technological methods of cultivation on the nutritional and energy intensity of fodder from alfalfa-cereal grass mixtures are presented in the article. It has been established that the inclusion of Medicago sativa in cereals significantly improves the nutritional value and energy intensity of feed. Cereal grasses, even with the introduction of nitrogen fertilizers, contain less exchangeable energy (8.8 MJ/kg) and are less supplied with digestible protein - 138-143 g/ feed unit, compared to feed obtained from mixtures of Medicago sativa with cereal crops – 9.1-9,2 and 160-174, respectively. The most nutritious was the fodder according to the technological models, which provided for the introduction of $N_{60}P_{60}K_{90}$+Fumar on legume-cereal grasses Medicago sativa + Bromopsis inermis + Lolium perenne and Medicago sativa + Bromopsis inermis + Festuca orientals.

Keywords: *digestible protein, energy intensity, Medicago sativa, cereal components, herbal mixture.*

Introduction.

The food security of any country, the quality and completeness of nutrition, and therefore the health of people, are largely determined by the supply of the country's population with products of animal origin - milk, meat, eggs. However, in recent decades, Ukraine has seen a decrease in the production of livestock products, which is caused by the action and interaction of many factors, one of which is the insufficient production of high-quality feed, which significantly affects the efficiency of the livestock industry. Under such conditions, the creation of a powerful fodder base, which provides for the procurement of a sufficient amount of complete fodder that meets the physiological requirements of animals, is an important economic task, the solution of which will significantly contribute to the overall increase in the profitability of the country's agro-industrial complex [2, 6].

Inadequate supply of livestock with complete high-protein fodder is associated with low yield of fodder crops and their protein imbalance. At the same time, the provision of a feed unit with digestible protein is often only 80-85 g instead of the scientifically justified 105-115 g [3, 7].

One of the ways to reduce the deficit of feed protein and produce balanced feed is the cultivation of leguminous-cereal grass mixtures, which most fully meet the physiological needs of animals. Such crops significantly prevail in terms of yield, which significantly reduces the cost of feed and contributes to the increase in the profitability of animal husbandry [4, 5, 9].

In many countries of the world, thanks to the use of the potential of leguminous herbs, producers significantly reduce the dependence of onion cultivation on mineral nitrogen [6, 10]. Among the main reasons for the need to partially replace mineral nitrogen with biological nitrogen in onion cultivation, the high cost and energy-intensive production of nitrogen fertilizers, high environmental risks on grasslands and, in the conditions of Ukraine, their insufficient amount from the total need should be highlighted [8, 10].

Many scientists worked on studying this problem. however, the regularities of the influence of certain agrotechnical and biological factors on the nutritional value and energy value of forage from leguminous and cereal fodder agrophytocenoses are still incompletely revealed [2, 4, 6, 8].

The purpose of the research is to study the influence of technological methods of cultivation on the nutritional value and energy intensity of fodder from alfalfa-cereal grass mixtures.

Research materials and methods.

Experimental research was carried out during 2014-2016 in the conditions of the SS "Agronomic Research Station" of NULES of Ukraine [1]. The scheme of the field experiment included: factor A - herbaceous (grass species and their seed sowing rate, kg/ha): 1) *Medicago sativa*, 16; 2) *Medicago sativa*, 12 + *Festuca orientals*, 10 + *Festuca pratensis*, 8; 3) *Medicago sativa*, 10 + *Festuca orientals*, 10 + *Dactylis glomerata*, 8; 4) *Medicago sativa*, 10 + *Bromopsis inermis*, 14 + *Lolium perenne*, 10; 5) *Medicago sativa*, 10 + *Bromopsis inermis*, 14 + *Festuca orientals*, 8; 6) *Bromopsis inermis*, 14 + *Festuca orientals*, 8 (cereal grass), control; factor B – fertilizers (nutrients and their norms): 1) without fertilizers, control; 2) $P_{60}K_{90}$; 3) $N_{60}P_{60}K_{90}$; 4) $N_{60}P_{60}K_{90}$ + growth stimulator Fumar.

The area of the sowing plot is 30 m², the accounting plot is 25 m², the repetition of the experiment is four times. The technology of growing perennial grasses,

with the exception of the investigated factors, is generally accepted for the conditions of the Right Bank Forest Steppe of Ukraine. *Medicago sativa* - variety Regina, *Bromopsis inermis* – variety Mars, *Lolium perenne* – variety Kyivska 101, *Festuca orientals* - variety Danka, *Festuca pratensis* – variety Dibrova, *Dactylis glomerata* – variety Natalka were sown in the experiment.

Phosphorus-potassium fertilizers were applied annually in the fall, nitrogen fertilizers were applied in three doses of N_{20}: in the spring on frozen soil and after the first and second mowing. The following types of fertilizers were used in the experiment: nitrogen – in the form of ammonium nitrate with an active substance content of 34%, potash – calimagnesia with an active substance content of 26%, phosphoric – simple superphosphate with an active substance content of 18.7%. Spraying of grasses with Fumar growth stimulator was carried out at a dose of 2 l/ha with a water consumption of 200 l/ha during the period when cereal grasses were in the tillering phase, and alfalfa sowing was in the branching phase. Sowing was carried out in early spring in the usual row method.

The soil of the experimental field is a typical black soil with low humus, coarse dust and light loam mechanical composition. The content of humus in the topsoil is 4.2-4.6%, the absorption capacity is 31-32 mg-eq. per 100 g of soil, the degree of saturation with bases - about 90%. The content of mobile phosphorus according to Machigin - 4.0-5.5 mg per 100 g of soil, exchangeable potassium - 15.0-16.5 mg per 100 g of soil, easily hydrolyzed nitrogen according to Kornfield - about 14-16 mg / 100 g. The reaction of the soil solution is close to neutral with a saline pH of 6.7-7.0.

The average daily air temperature during the growing season exceeded the long-term average value (12.2 °C) by 1.3-1.6 °C. At the same time, the amount of precipitation exceeding the norm (510 mm) was noted only in 2014 - by 147 mm, which had a positive effect on the formation of the crop of legume-cereal grass mixtures in the first year of using the grass stand. In 2016 and 2015, the amount of precipitation was insufficient by 217-127 mm.

Results and discussion.

The selection of the optimal complex of technological factors for growing alfalfa-cereal grass mixtures determines not only the amount of their yield, but also largely determines the nutritional value and energy intensity of feed - indicators of the quality of feed according to the current standards of Ukraine [3, 5, 10]. Thus, as the research results showed, the content of fodder units in the dry mass of different types of grass stands ranged from 73 to 82%, exchangeable energy - from 8.6 to 9.5 MJ / kg with the supply of one fodder unit with digestible protein at the level of 107-174 g (table).

Nutritional value, energy intensity of dry mass and supply of digestible protein of the feed unit of the green mass of alfalfa-cereal grass mixtures depending on the fertilizer

Fertilization	Content		Provision of a feed unit with digestible protein, g
	feed units, %	exchangeable energy, MJ/kg	
Medicago sativa			
Without fertilizers	**81**	**9,4**	**151**
$P_{60}K_{90}$	**82**	**9,5**	**154**
$N_{60}P_{60}K_{90}$	**82**	**9,5**	**164**
$N_{60}P_{60}K_{90}$ + Fumar	**82**	**9,5**	**170**
Medicago sativa + Festuca orientals + Festuca pratensis			
Without fertilizers	**76**	**9,0**	**152**
$P_{60}K_{90}$	**77**	**9,1**	**155**
$N_{60}P_{60}K_{90}$	**76**	**9,2**	**160**
$N_{60}P_{60}K_{90}$ + Fumar	**77**	**9,2**	**167**
Medicago sativa + Festuca orientals + Dactylis glomerata			
Without fertilizers	**76**	**9,0**	**155**
$P_{60}K_{90}$	**78**	**9,1**	**152**
$N_{60}P_{60}K_{90}$	**77**	**9,2**	**165**
$N_{60}P_{60}K_{90}$ + Fumar	**77**	**9,2**	**168**
Medicago sativa + Bromopsis inermis + Lolium perenne			
Without fertilizers	**76**	**8,9**	**158**
$P_{60}K_{90}$	**77**	**9,1**	**158**
$N_{60}P_{60}K_{90}$	**78**	**9,1**	**168**
$N_{60}P_{60}K_{90}$ + Fumar	**77**	**9,2**	**174**
Medicago sativa + Bromopsis inermis + Festuca orientals			
Without fertilizers	**76**	**9,0**	**156**
$P_{60}K_{90}$	**77**	**9,1**	**158**
$N_{60}P_{60}K_{90}$	**76**	**9,2**	**172**
$N_{60}P_{60}K_{90}$ + Fumar	**77**	**9,2**	**173**
Bromopsis inermis + Festuca orientals			
Without fertilizers	**73**	**8,6**	**107**
$P_{60}K_{90}$	**74**	**8,7**	**112**
$N_{60}P_{60}K_{90}$	**75**	**8,8**	**138**
$N_{60}P_{60}K_{90}$ + Fumar	**75**	**8,8**	**143**
Zootechnical standard	**70-100**	**8-11**	**110-115**

The inclusion of Medicago sativa in cereal grass mixtures improved the nutritional value of feed by the content of feed units and energy intensity – by the content of exchangeable energy. Thus, the content of exchangeable energy in alfalfa-cereal grass stands was 8.6-9.2 MJ/kg. At the same time, Medicago sativa was characterized by better nutrition and energy intensity – the dry mass of alfalfa contained 4-6% more feed units and 0.3-0.5 MJ/kg more exchangeable energy. Under the influence of fertilizer, the parameters of nutrition and energy intensity changed little. The content of both feed units and exchangeable energy were within zootechnical standards.

The supply of digestible protein per feed unit in the conducted studies was quite high and, depending on the studied factors, ranged from 107 to 174 g. To a greater extent, the value of the mentioned indicator was influenced by symbiotic and mineral nitrogen. With the inclusion of Medicago sativa in cereals, as well as on Medicago sativa grass stands on backgrounds without nitrogen application, the availability increased by 44-62 g, and on backgrounds with the introduction of mineral nitrogen - by 22-31 g. no significant difference was observed with protein.

The introduction of nitrogen fertilizers increased the supply of digestible protein to the forage unit to a greater extent on cereal grass stands than on alfalfa and alfalfa-cereal grass stands.

The highest provision of the feed unit with digestible protein was obtained in all grass stands with the application of $N_{60}P_{60}K_{90}$+Fumar. On the Medicago sativa and Medicago sativa grass stands in mixtures with cereal crops, the supply of feed unit was within 167-174 g, which is 13-19 g more compared to the option without fertilizer application, on the cereal grass stand - at the level of 143 g, which is 36 g more , than without fertilization. Thus, the addition of Fumar growth biostimulator to $N_{60}P_{60}K_{90}$ increased the supply of digestible protein to the feed unit, but mostly insignificantly.

Conclusions and suggestions.

The addition of *Medicago sativa* cereal grass mixtures significantly improves the nutritional value and energy intensity of the feed. Cereal grasses, even with the introduction of nitrogen fertilizers, contain less exchangeable energy (8.8 MJ/kg) and are less supplied with digestible protein – 138-143 g/ feed unit, compared to feed obtained from mixtures of *Medicago sativa* with cereal crops – 9.1-9,2 and 160-174, respectively. The most nutritious was the fodder according to the technological models, which provided for the introduction of $N_{60}P_{60}K_{90}$+Fumar on legume-cereal grasses *Medicago sativa* + *Bromopsis inermis* + *Lolium perenne* та *Medicago sativa* + *Bromopsis inermis* + *Festuca orientals.*

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