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INFLUENCE OF TECHNOLOGICAL GROWING MEASURES ON THE NUTRITION OF FORAGE AGROPHYTOCOENOSES

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Abstract. *The results of studies on the influence of mineral fertilizers, the species composition of the components of fodder agrophytocenoses and the ratio of sowing rates of Avena sativa plants with leguminous crops on the feed value of mixtures are presented. It was established that the green mass of a mixture of Avena sativa with Pisum arvense, sown in the norm, respectively, 40 and 60% of the total for the application of $N_{30}P_{30}K_{30}$, is the most balanced in terms of organic matter content. According to this technological model of cultivation, the fodder mass contains 22.8% crude protein, 3.3% crude fat, 24.9% crude fiber, 43.1% BER.*

Key words: *Avena sativa, Vicia sativa, Pisum arvense, sowing rate, mineral fertilizer, crude protein, crude fiber, crude fat, exchangeable energy.*

Introduction.

According to the data of many scientists and production experience in different soil and climatic zones, an important role in increasing the productivity of the livestock industry belongs to mixed crops, which provide higher productivity of the forage area and obtain more nutritious feed [2]. However, the productivity of such crops depends significantly on the optimal composition of the fodder agrophytocenosis components, capable of increasing field productivity due to more complete and uniform use of nutrients, moisture and solar energy [1]. It is possible to increase the productivity of mixed crops only under the condition of understanding the complex relationships and mutual influence between individual plant species during their growth and development in agrocenoses [3]. Competently designed grass beds of mixed crops have a positive effect on improving the microclimate of agrocenoses. Thus, higher resistance to adverse environmental factors at certain stages of organogenesis of one of the components can contribute to the normal growth of plants of another, the adaptation of which will be

higher already at the next stage of organogenesis in other conditions. This is confirmed by the greater drought resistance of leguminous crops compared to cereal crops. It has been proven that due to the cultivation of mixtures, the productivity increases by 1.2-3.2 times, and the profit by 42-149% [4].

Correct selection of fodder crops for joint cultivation on the basis of the above-mentioned biological processes makes it possible to more fully use the factors of life in increasing the productivity of annual agrophytocenosis [2].

The purpose of the research is to study the influence of mineral fertilizer rates, species composition and the ratio of Avena sativa plants and leguminous crops on the feed value of mixtures.

Research materials and methods.

Field experiments were conducted during 2017-2018 in the fields of the ‘‘Dzhupinivske FG’’, Vinnytsia region, which is located in the forest-steppe zone of the central part of Right Bank Ukraine on gray forest medium-loamy soil.

In the experiments, varieties of annual crops were studied: Avena sativa of the Spurt variety, Pisum arvense of the Fundator variety, Vicia sativa of the Oziryan variety. Agrotechnics of growing one-year legume-cereal mixture of spring crops is generally accepted for the right-bank forest-steppe. The norm of sowing crops in single-species crops is: oats 5 million/ha, vetch 2 million/ha, sedge 1.2 million/ha. Mineral fertilizers were applied under pre-sowing cultivation in the form of nitroammofoska and limestone nitrate.

Research results and their discussion.

The nutritional value of fodder agrophytocenoses significantly depends on the species composition of plant components, their sowing rates and mineral fertilizers. Thus, with an optimal ratio and a well-founded selection of cereal and leguminous crops in the composition of the grass mixture, taking into account their biological characteristics, it is possible to obtain feed characterized by a good balance in terms of digestible protein. The correct combination of plants in agrophytocenoses provides favorable conditions for the vegetation of each component.

The application of mineral fertilizers in optimal rates also has a positive effect on the quality of feed, due to increasing the protein content and reducing the fiber content.

One of the main indicators that characterizes the feed value of feed is the crude protein content. The insufficient content of crude protein reduces the productive effect of other nutrients, which leads to a decrease in animal productivity and a significant overspending of feed per unit of livestock production.

According to the results of our research, it was established that on plots without mineral fertilizers, the maximum crude protein content can be obtained by growing Avena sativa with Pisum arvense, where 40% of Avena sativa and 60% of Pisum arvense were sown from the full rate. The content of crude protein in this feed was 20.2% (Table 1).

Application of mineral fertilizers at the rate of $N_{30}P_{30}K_{30}$ contributed to the increase of crude protein content in leguminous-cereal mixtures to 17.8-20.5%. At this level of mineral fertilizer, the maximum content of it - at the level of 22.8% was obtained for planting Avena sativa and Pisum arvense in the norm, respectively 40 and 60% of the full amount.

1. Chemical composition of dry matter of fodder agrophytocenoses, average for 2017-2018, %

Norm fertilizers	Option	Raw protein	Cheese fiber	Raw fat	BER
without fertilizer (control)	*Avena sativa*, 100	13,7	28,1	2,4	48,5
	Avena sativa, 60 + *Vicia sativa*, 40	17,3	26,9	2,4	46,1
	Avena sativa, 60 + *Pisum arvense*, 40	18,1	27,3	2,5	45,3
	Avena sativa, 40 + *Vicia sativa*, 60	18,6	26,4	2,6	45,1
	Avena sativa, 40 + *Pisum arvense*, 60	20,2	26,4	2,8	43,9
$N_{30}P_{30}K_{30}$	*Avena sativa*, 100	14,1	27,7	2,6	48,5
	Avena sativa, 60 + *Vicia sativa*, 40	17,8	26,2	2,7	46,2
	Avena sativa, 60 + *Pisum arvense*, 40	18,5	26,7	2,8	45,4
	Avena sativa, 40 + *Vicia sativa*, 60	19,1	26,8	2,7	45,6
	Avena sativa, 40 + *Pisum arvense*, 60	20,5	26,1	2,9	45,6
$N_{45}P_{45}K_{45}$	*Avena sativa*, 100	14,9	26,9	2,7	48,8
	Avena sativa, 60 + *Vicia sativa*, 40	18,7	25,5	2,8	46,4
	Avena sativa, 60 + *Pisum arvense*, 40	18,9	25,9	2,9	46,4
	Avena sativa, 40 + *Vicia sativa*, 60	19,8	24,9	2,9	45,9
	Avena sativa, 40 + *Pisum arvense*, 60	21,2	25,2	3,1	44,5
$N_{60}K_{30}K_{60}$	*Avena sativa*, 100	16,1	26,4	2,9	48,3
	Avena sativa, 60 + *Vicia sativa*, 40	19,6	25,2	2,9	47,2
	Avena sativa, 60 + *Pisum arvense*, 40	20,6	25,5	3,2	44,8
	Avena sativa, 40 + *Vicia sativa*, 60	20,9	25,5	3,1	45,3
	Avena sativa, 40 + *Pisum arvense*, 60	22,8	24,9	3,3	43,1

Notes: *1 - oats, 100%; 2 - oats, 60% + spring vetch, 40%; 3 - oats, 60% + diaper, 40%; 4 - oats, 40% + spring vetch, 60%; 5 - oats, 40% + diaper, 60%.

During zootechnical analysis, the content of crude fat and fiber was also determined in dry matter. It was determined that in the absence of fertilizer, the content of crude fat in the above-ground mass of leguminous-cereal mixtures was 2.4-2.8%, the introduction of mineral fertilizers helped to increase its content to the level of 2.9-3.3%.

Carbohydrates are the main component of the dry matter of plant feeds and rations. All carbohydrates in feed are divided into two groups: crude fiber and non-nitrogenous extractable substances (BER). Excessive crude fiber content in ruminant diets reduces digestibility and efficiency of nutrient use. However, it is necessary in a certain amount as a factor that normalizes digestion in the rumen.

According to the results of our research, it was established that the maximum content of crude fiber was contained in the vegetative mass of leguminous-cereal mixtures grown on unfertilized areas. The introduction of mineral fertilizers contributed to an increase in the proportion of leaves in the structure of grass stands, which in turn reduced the fiber content in the forage. Moreover, with an increase in the norm of mineral fertilizer, the content of crude fiber decreased.

The nutritional value of feed is also characterized by the content of non-nitrogenous extractive substances (BER). In the dry matter of the studied leguminous-cereal mixtures, the content of BER ranged from 43.1 to 46.2%. On variants without fertilizer application, the share of BER was 43.9-46.1% and decreased with the improvement of mineral nutrition of plants.

In general, the green mass of Avena sativa with Pisum arvense, sown normally, is the most balanced in terms of organic matter content, respectively 40 and 60% of the total amount due to the application of N30P30K30. Forage mass under this technological model of cultivation contains 22.8% crude protein, 3.3% crude fat, 24.9% crude fiber, 43.1% nitrogen-free extractive substances.

On the basis of the analysis of the energy value of the vegetative mass, it was found that the highest content of gross and exchangeable energy in green fodder was obtained for the cultivation of leguminous-cereal mixtures with a seeding rate of the leguminous component of 60% of the full seeding rate (Table 2).

2. Provision of 1 kg of dry matter with gross and exchangeable energy, average for 2017-2018, MJ

Sowing rate, %	Doses of fertilizers							
	Norm fertilizers		$N_{30}P_{30}K_{30}$		$N_{45}P_{45}K_{45}$		$N_{60}P_{30}K_{30}$	
	1*	2	1	2	1	2	1	2
Avena sativa, 100	17,92	9,24	18,00	9,32	18,12	9,50	18,34	9,69
Avena sativa, 60 + *Vicia sativa*, 40	18,10	9,49	18,24	9,65	18,38	9,84	18,58	10,00
Avena sativa, 60 + *Pisum arvense*, 40	18,26	9,52	18,38	9,67	18,49	9,84	18,71	10,01
Avena sativa, 40 + *Vicia sativa*, 60	18,39	9,72	18,35	9,78	18,50	10,00	18,64	10,12
Avena sativa, 40 + *Pisum arvense*, 60	18,50	9,75	18,55	9,85	18,70	10,05	18,88	10,18

Note: *1 - gross energy output; 2 - exchange energy output.

At such sowing rates on variants without fertilization, 1 kg of dry matter of the mixture of Avena sativa with Vicia sativa contained 9.72 MJ of exchangeable energy and 18.39 MJ of gross energy, and the mixture of Avena sativa with Pisum arvense contained 9.75 and 18, respectively. 50 MJ.

The highest content of gross and exchangeable energy in 1 kg of dry matter was obtained for the cultivation of Avena sativa in mixtures with Pisum arvense with a sowing rate of 60% of the full amount, which was 18.88 and 10.18 MJ, respectively.

By reducing the sowing rate of the leguminous component to 40% and applying mineral fertilizers at the rate of $N_{60}P_{30}K_{30}$, the content of gross and exchangeable energy decreased. Thus, for the cultivation of Avena sativa in mixtures with Vicia sativa, the indicators were 18.58 and 10.00 MJ/kg, in the mixture of Avena sativa with Pisum arvense they were slightly higher at the level of 18.71 and 10.01 MJ/kg. The introduction of 30-45 kg of nitrogen against the background of phosphorus-potassium fertilizers led to a slight increase in gross and exchangeable energy values.

Conclusions.

Thus, the green mass of a mixture of Avena sativa with Pisum arvense, sown in the norm, respectively, 40 and 60% of the total amount due to the application of N30P30K30, is the most balanced in terms of organic matter content. According to this technological model of cultivation, the fodder mass contains 22.8% crude protein, 3.3% crude fat, 24.9% crude fiber, 43.1% BER.

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