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YIELD DYNAMICS OF SEEDED MEADOW LEGUME-CEREAL AGROPHYTOCENOSES DEPENDING ON FERTILIZER

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Our studies have revealed that the highest yield of dry matter per hectare of crop was obtained on the plots of land where they sowed seeds of alfalfa inoculated with Ryzobofit, applied complete fertilizer $N_{60}P_{60}K_{60}$ on the surface and conducted foliar application of humic fertilizer with growth stimulator properties like Lihnohumat in the amount of 11.1 t $ha^{-1.}$

Key words: *leguminous grass mixture, fertilizer, dry matter, yield*

To investigate the production of a sufficient number of full fodders with low cost, it is necessary to grow seeded perennial grasses and their mixtures. Fertilization is the most important way to improve productivity of perennial meadow agrophytocenosis [2]. If soils lack in digestible nutrients, meadow grasses reduce productivity very quickly. That is why it is of particular importance to provide them with nitrogen [3, 6].

With extensive use of chemicals in agriculture and considering economic factors, the role of biological nitrogen is becoming greater. Its use provides/creates favorable conditions for farming, allows applying mineral nitrogen more efficiently and reducing pollution of the environment significantly [7].

Use of plant growth stimulators of natural origin like Lihnohumat is another important factor in increasing crop yields. It is a humic fertilizer with properties of a growth stimulator, enriched with micronutrients in chelate form and recommended in a number of European countries to be used in ecological/environmentally-friendly agriculture [5].

The aim of our study was to analyze the dynamics of yield of seeded meadow legume-cereal agrophytocenosis depending on fertilizer.

Materials and methods of work. The research was conducted in the years 2011 and 2012 at the principal farmstead of Ternopil State Agricultural Research Station of the Institute of Fodders and Agriculture of Podillia of the National Academy of Agrarian Sciences – Separate Unit of the National University of Life and Environmental Sciences of Ukraine "Zalishchyky Agricultural College named after Yevhen Khraplyvyi" in Zalishchyky district, Ternopil region.

The scheme of the experiment was as follows:

1 – Control;

2 – $P_{60}K_{60}$;

3 – $N_{60}P_{60}K_{60}$;

4 – Lihnohumat;

5 – $P_{60}K_{60}$ + Lihnohumat;

6 – $N_{60}P_{60}K_{60}$ + Lihnohumat.

The experiment took into consideration two factors: A (inoculation) and B (type of fertilizer)

Bacterial drug Ryzobofit was used to inoculate the seeds of alfalfa prior to sowing.

The experiment was conducted in accordance with the generally accepted methods of fodder and grass farming. [4].

The area of the plots of land was 36 $м^2$, the experiment was repeated three times, and the options were set according to the method of split plots.

The received data were processed statistically according to B.A. Dospekhov's method and using computer software program Statistica 6.0.

Results of the studies. Harvest formation of legume-cereal grass mixtures in 2011 and 2012 took place in insufficient and uneven moisture distribution. In 2011, during the growing season the rainfall was 258.9 mm or 57% of the average long-term rate, and the average air temperature was 15.1°C. The rainfall was 59.7 mm,

112 mm and 87.2 mm during the formation of the first, second and third hay harvests respectively.

In 2012, during the growing season of meadow grass the rainfall was 363.3 mm or 80% of the average long-term rate, and the average daily air temperature was 16.1°C.

The rainfall was 105.5 mm, 160.9 mm, 41.9 and 55 mm during the formation of the first, second, third and fourth hay harvests respectively.

In such weather conditions the yield of legume-cereal grass mixture was formed depending on the method of fertilization (see: Table 1).

Yield of legume-cereal grass mixture depending on the fertilizer, t ha^{-1}

Type of fertilizer	Year			Increment from the fertilizer, t ha^{-1}	Annual coefficient of yield variation, %
	2011	2012	Average		
Without bacterial inoculation					
Control	4,98	8,34	6,66	-	35,75
$P_{60}K_{60}$	6,47	10,36	8,41	1,75	33,01
$N_{60}P_{60}K_{60}$	8,04	11,01	9,52	2,86	22,24
Lihnohumat	5,80	9,16	7,48	0,82	31,84
$P_{60}K_{60}$+ Lihnohumat	7,40	11,55	9,47	2,81	31,09
$N_{60}P_{60}K_{60}$+ Lihnohumat	8,85	11,63	10,24	3,58	19,61
With bacterial inoculation					
Control	5,52	9,29	7,41	-	36,43
$P_{60}K_{60}$	7,29	11,60	9,44	2,03	32,44
$N_{60}P_{60}K_{60}$	8,79	11,65	10,22	2,81	20,32
Lihnohumat	6,48	10,03	8,25	0,84	30,68
$P_{60}K_{60}$+ Lihnohumat	8,39	12,41	10,40	2,99	27,66
$N_{60}P_{60}K_{60}$+ Lihnohumat	9,73	12,48	11,10	3,69	17,90
$LSD_{0.05}$ t ha^{-1}	A - 0,09, B - 0,16, AB - 0,22	A - 0,14, B - 0,25, AB - 0,35	A – 0,08, B - 0,14, AB - 0,19		

Thus, in 2011 the output of dry matter per hectare, depending on the version of the experiment, was 4.98-9.73 tons. The lowest output was registered without fertilizers and inoculation (benchmark) – 4.98 t ha^{-1}, and the highest output was registered after the treatment of the seeds of alfalfa with the bacterial drug Ryzobofit, application of $N_{60}P_{60}K_{60}$ on the surface, and foliar application of Lihnohumat – 9.73 t ha^{-1}.

Despite the arid conditions during the growing season in 2011, nitrogen fertilizers, compared with phosphorus-potassium ones, provided a reliable increase in dry matter yield. This can be explained by the rains at the time of their application.

In 2012, due to more precipitation (at 104.4 mm) the yield of meadow legume-cereal grasses increased to 8.34-12.48 t ha^{-1}, depending on the version of the experiment.

Like in the previous year of the experiment, the lowest output of dry matter was obtained without fertilizers and inoculation (benchmark) – 8.34 t ha^{-1}, and the highest output was registered after the treatment of the seeds of alfalfa with Ryzobofit, application of $N_{60}P_{60}K_{60}$ on the surface, and foliar application of Lihnohumat – 12.48 t ha^{-1}.

In 2012, we did not register any significant increase in the yield of dry matter after the application of nitrogen fertilizers compared with phosphorus-potassium ones. This is due to high air temperature and drought after the application of mineral nitrogen.

At the same time, due to more precipitation during the whole growing season for each of the hay harvests, biological nitrogen in phosphorus-potassium variations proved to be very effective. Thus, after the phosphorus-potassium fertilizers were used, dry matter yield was 11.6 t ha^{-1}, whereas with a complete fertilizer the yield was 11.65 t ha^{-1}. When using phosphorus-potassium fertilizer and Lihnohumat the yield of dry matter increased to 12.41 tons per hectare, whereas with a complete fertilizer and Lihnohumat the yield was 12.48 t ha^{-1}.

On average, during the years of research the highest yield of dry matter was obtained in the case of sowing inoculated seeds of alfalfa, application of a complete fertilizer $N_{60}P_{60}K_{60}$ on the surface and foliar application of Lihnohumat – 11.1 t ha^{-1}, which is 4.44 tons per hectare more than the benchmark.

It was ascertained that fertilizers reduced annual yield fluctuations of dry matter, leveling adverse conditions during vegetation and providing stable yields. Thus, the variation coefficient of fertilizer application decreased from 35.75 to 19.61% without bacterial inoculation of the seeds, whereas in the case of inoculated seeds it decreased from 36.43 to 17.9%. The yield was most leveled after a complete mineral fertilizer ($N_{60}P_{60}K_{60}$) was applied on the surface and after foliar application of a humic fertilizer with properties of a growth stimulator Lihnohumat. In this case, the variation coefficient was 19.61% without seed inoculation and 17.9% if the seeds were inoculated.

It is worth mentioning that Lihnohumat also helped reduce the negative impact of weather conditions on the harvest formation by reducing the coefficients of variation compared with the options where it was not used.

Conclusions. The highest productivity of dry matter was obtained in the case of sowing alfalfa seeds inoculated with Ryzobofit followed by the use of the mineral fertilizer ($N_{60}P_{60}K_{60}$) applied on the surface and foliar application of the humic fertilizer Lihnohumat which has properties of a growth stimulator – 11.1 t ha^{-1}. In this case, we registered the lowest effect of adverse weather conditions on the formation of productivity of meadow grass, where the coefficient of yield variation during the years of research was 17.9%.

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ДИНАМИКА УРОЖАЙНОСТИ СЕЯНОГО ЛУГОВОГО БОБОВО-ЗЛАКОВОГО АГРОФИТОЦЕНОЗА В ЗАВИСИМОСТИ ОТ УДОБРЕНИЯ

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На основании проведенных исследований установлено, что наивысший выход сухого вещества с одного гектара 11,10 т/га получен на варианте, где высевались инокулированные Ризобофитом семена люцерны посевной, применялось полное минеральное удобрения $N_{60}P_{60}K_{60}$ поверхностно и проводилось внекорневое внесение гуминового удобрения с микроэлементами в хелатной форме со свойствами стимулятора роста Лигногумат.

Ключевые слова: бобово-злаковая травосмесь, удобрения, сухое вещество, урожайность

ДИНАМІКА УРОЖАЙНОСТІ СІЯНОГО ЛУЧНОГО БОБОВО-ЗЛАКОВОГО АГРОФІТОЦЕНОЗУ ЗАЛЕЖНО ВІД УДОБРЕННЯ

І.І. СЕНИК

На основі проведених нами досліджень встановлено, що найвищий вихід сухої речовини з 1 га посіву одержано на варіанті, де висівали інокульоване ризобофітом насіння люцерни посівної, застосовували $N_{60}P_{60}K_{60}$ поверхнево та позакоренево-гумінове добриво з властивостями стимулятора росту лігногумат – 11,10 т/га.

Ключові слова: *бобово-злакова травосумішка*, *удобрення*, *суха речовина*, *урожайність*