The Applicability of Soil's Fertilizers in Increasing of Production Effects in *Lolium Perenne* and *Lolium Multiflorum* Cultivation

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Abstract: The aim of the study was to determine the effect of soil fertilizers, used on the background of NPK fertilization on the productivity of *Lolium perenne* and *Lolium multiflorum* in different time of harvest. In 2012-2013 the following species and varieties of forage grasses: *Lolium perenne* and *Lolium multiflorum* were cultivated. It was the following experimental subjects: K-control (without fertilization and fertilizer), NPK (N-150 kg ha⁻¹ as a 34% ammonium nitrate, P-80 kg P₂O₅ ha⁻¹, K-120 kg K₂O ha⁻¹), UG-UGmax bio-preparation, EU-Eco bio-preparation (fertilizer), HA-Humus Active as bio-preparation.

Key words: Bio-preparations, soil's medium amendment, yield, grass.

1. Introduction

Preparations as soil conditioners due to humus and microorganisms contribute to the improvement of the biological activity of soil, increasing the binding of free nitrogen from the air, reducing the erosion and loss of nutrients. Fertilizer is also seen as a preparation useful in crop protection, especially in pro-ecological crops. The aim of the study was to determine the effect of three soil fertilizers, used on the background of NPK fertilization on the productivity of *Lolium perenne* and *Lolium multiflorum* in different time of harvest.

2. Materials and Methods

On the experimental objects of Grassland Department in 2012-2013 the following species and varieties of forage grasses: *Lolium perenne* and *Lolium multiflorum* were cultivated. The following experimental treatments were used:

K-control (without fertilization and fertilizer);

NPK-N-150 kg·ha⁻¹ as 34% ammonium nitrate was used in three divided doses, sown under each re-growth. Phosphorus fertilization P-80 kg·ha⁻¹ as 46% superphosphate was sowed once for spring re-growth, K-120 kg K·ha⁻¹ of 60% potassium, was applied for each regrowth, in three equal doses;

UG-UGmax as biological preparation was used annually for spring re-growth in the shooting phase of the grass, at a dose of 0.9 L·ha⁻¹;

EU-Eco fertilizer as biological preparation was used annually for spring re-growth in the shooting phase of the grass, at a dose of 5 L·ha⁻¹;

HA-Humus Active as biological preparation was used annually for spring re-growth in the shooting phase of the grass, at a dose of 50 L·ha⁻¹.

The composition of biological preparations are shown in Table 1. The formulations in the form of a spray were used. All objects were three times out in 2012-2013. An assessment of the level of dry matter yields of plants (t·ha⁻¹), was done. On this base the yield increase for each object relative to the control fertilizer-K was also calculated. The results were evaluated statistically by performing analysis of

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Preparation	Macronutrients (g·kg ⁻¹)							Micronutrients (mg·kg ⁻¹)		
	N	P ₂ O ₅	K ₂ O	Ca	Mg	Na	Mn	Fe	Zn	Cu
UGmax	1.2	0.5	3.5	-	0.1	0.2	0.3	-	-	-
	Organic components									
	Improve soil preparation containing lactic acid bacteria, photosynthetic bacteria, <i>Azotobacter</i> , <i>Pseudomonas</i> , yeasts and <i>Actinomycetes</i> and micro-and macroelements.									
Eco fertilizer	0.6	0.6	0.8	-	-	-	-	-	-	-
	Organic components									
	Item breeding earthworms <i>Eisenia fetida</i> , improving the soil, it is the extract of vermicompost cattle in the form of a suspension-characterized by the presence and diversity of saprophytic fungi, including mikorytycznych, protect the root system from getting infected soil pathogens.									
Humus Active Papka	0.2	3.0	5.5	3.0	0.5	-	15	500	3	1
	Organic components									
	Improve soil preparation, it is composed of 90% organic matter in the form of humus and positive microorganisms (<i>Azotobakter</i> , <i>Nitrosomonas</i> , photosynthetic bacteria and fungi positive).									

Table 2 Yield (t DM·ha⁻¹) *Lolium perenne* and *Lolium multiflorum* depending on NPK fertilizer and preparation in each cut (average for year).

NPK fertilization												
Cut	Species	Bez without NPK				NPK				Bez NPK	NPK	Mean
		K ₀	UG	EU	HA	K _{NPK}	UG	EU	HA			
P1	Lp	5.08	4.22	6.40	5.18	4.85	5.67	4.10	4.57	5.58	4.43	4.95 A
		Aa	Aa	Aa	Aa	Aa	Aa	Ab	Bab	Aa	Ab	
	Lm	2.81	3.61	5.29	5.53	4.59	5.72	4.60	6.83	4.48	4.91	4.88 A
		Bb	Bb	Aa	Aa	Ab	Aa	Ab	Aa	Aa	Aa	
Mean		3.95 b	3.92 b	5.85 a	5.30 a	4.72 a	5.70 a	4.35 a	5.70 a	5.20 a	4.67 b	
P2	Lp	1.61	2.89	1.56	2.44	3.53	3.32	3.14	2.98	2.23	3.14	2.69 A
		Ab	Aa	Ab	Aa	Aa	Aa	Aab	Ab	Ab	Aa	
	Lm	1.68	1.98	1.33	2.74	3.86	2.85	1.90	3.54	2.15	2.82	2.49 A
		Ab	Bab	Ab	Aa	Aa	Aab	Bb	Aa	Ab	Ba	
Mean		1.65 b	2.44 a	1.45 b	2.59 a	3.70 a	3.09 a	2.52 b	3.20 a	2.20 b	2.97 a	
P3	Lp	2.61	4.10	1.67	3.97	3.66	6.88	2.89	3.74	3.78	3.60	3.69 A
		Ab	Aa	Ab	Aab	Ab	Aa	Ab	Ab	Aa	Aa	
	Lm	1.47	3.60	1.87	3.22	1.06	1.60	2.28	3.13	2.04	2.52	2.28 B
		Bb	Ba	Ab	Aa	Bb	Bb	Aab	Aa	Ba	Ba	
Mean		2.04 b	3.85 a	1.77 b	3.60 a	2.36 b	4.24 a	2.59 b	5.31 a	2.91 a	3.53 b	

Averages in lines marked with the same lowercase letters are not significantly different.

Average in columns marked with the same capital letters are not significantly different.

Fig. 1 Increase in yield of *Lolium perenne* in relation to the control in each experimental objects.

Source: own research.

Fig. 2 Increase of *Lolium multiflorum* yield compared to the control in each experimental objects.

Source: own research.

4. Conclusion

Regardless of the mineral fertilization, the use of soil improvers preparations increased the yield of *Lolium perenne* and *Lolium multiflorum*. Regardless of the tested species, on objects without mineral fertilization highest, yields were harvested from plots supplied with UGmax fertilizer and Humus Active. In the case of *Lolium perenne* best production results were obtained using spray with UGmax preparation. *Lolium multiflorum* the best yielding acted on objects powered by Active Humus preparation. Analysis of crop regrowth relative to control objects showed that the highest value of this parameter occurred in the cultivation of *Lolium perenne* on the objects of NPK with UGmax. However, in the case of *Lolium multiflorum* on the objects of NPK with Humus Active preparation.

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