

Productivity of perennial agrophytocenosis depending on the content of grass mixtures and regime of their use

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The purpose. To study effect of the content of grass mixtures and regime of their use upon the yield of dry matter and botanical content of total plant weight for legume-cereal grass stands. **Methods.** Field and laboratory probes. **Results.** In conditions of South part of Western Forest-steppe on downslopes with acid and low natural fertility soils the most productive was the grass mixture of lotus (*Lótus corniculátus*), 10 million/hectare viable seeds, with fescue (*Festuca arundinacea*), 2,1 million/hectare viable seeds, which ensured an exit of dry matter in size of 7,13 t/hectare at 3-hay cutting use of grass stand. Thus the share of lotus in total plant weight of the 1-st hay cutting made 47,1 – 50,9%, of the 2 – nd — 57,3 – 63,2%, and of the 3-rd hay cutting — 45 – 48,4 %. **Conclusions.** For effective use of slope lands it is necessary to cultivate grass mixture of lotus with fescue at 3-hay cutting regime.

Key words: *perennial grasses, grass mixtures, dry matter, botanical content.*

Aim. To investigate the effect of grass mixtures content and usage mode on dry matter collection and on green mass yield botanical composition from bean-cereal grass. **Methods.** Field- and laboratory research. **Results.** In conditions of southern part of western forest Steppe on slopes with acidic low natural fertility soils, the most productive one proved to be the grass mixture of horned lapwing, 10 mln/ha germinating seeds with fescue fescue, 2,1 mln/ha germinating seeds, which provided the dry matter output 7,13 t/ha at herbage triple use. At this, the horned lapwing part in green mass yield of the first slope made 47,1-50,9 %, the second one – 57,3-63,2 %, the third one – 45-48,4 %. **Conclusions.** For the effective sloping ground usage, to grow lapwing-fescue with triple-slope mode of herbage use.

Key words: *perennial grass, grass mixtures, dry matter, botanical composition.*

The idea of lands part seizure for intensive agricultural using and their transformation into natural forage lands – this is a principally new direction of nature usage optimization in Ukraine. The calculations show that, from economical and ecological point of view, it is irrational and disadvantageous to cultivate yearly the slopes with steepness over 3°. The lands which take place on such slopes must certainly be seized from cultivation. At the same time, the most expedient is to take them over with perennial herbs and to use them as hayfields and pastures with regulated livestock grazing [1].

The best way to create high-quality- and productive herbages is sowing of bean-cereal grass mixtures [2,3]. The ones with 50-% norm of cereal grasses sowing and full norm of bean grasses are noted with high productivity [4]. According to data of Carpathian region NAAS Institute of agriculture [5], bean-cereal herbages exceed in 8-10 times the natural ones by productivity and protein collection. The perfection of grass mixtures composition should be continued by meadow-growers constantly, following the creation of new herbs varieties [6]. The correct selection of perennial herbs species is the framework for creating highly-productive herbages [7]. At reclaiming the erosion-dangerous slopes for creating seeded hay-making, the advantage is given to bean-cereal grass mixtures in which clover racetrack and horned lapwing take the prominent place [8].

The herbage mowing terms and frequency have a significant effect on seeded herbages longevity and yield. Too early mowing weakens the root system development, resulting to sward longevity- and productivity reduction. The frequent mowing weakens further outgrowing and can lead even to herbs death [9]. Yet, at two-fold usage of perennial meadow herbage, the productivity made 7,1-7,8 t/ha of dry mass, and at the three-fold one – 8,1-9,4 t/ha [10].

Research aim – to determine bean-cereal herbage productivity depending on grass mixtures composition and mode of use.

Research methods. The experiments were conducted in trial field of Bukovinian state agricultural research station NAAS for 2013-2015 on slope of south-western exposition with steepness 5-7°. The trial sites soils the gray forest heavy loam medium-edged (pH_{con} – 5,4; humus content – 1,84 %; nitrogen which is easily hydrolyzed – 84 mg/kg; phosphates mobile forms (P₂O₅) – 32 mg/kg (by Muslova); exchangeable potassium content (K₂O) (by Kirsanoff) – 145 mg/kg). The research were carried out according to commonly used techniques on fodder production and meadow growing [11]. the yield data were processed with the dispersion analysis method according to „Field trial methods” B.O. Dosphehoff [12], using the modern software package on PC.

Research results. The grass mixtures composition and using regime were significantly effecting on dry matter outgo from bean-cereal herbage. In 2013, the grass mixture of horned lapwing and fescue fescue proved to be more productive, compared to control one of horned lapwing and timothy grass. It provided the dry matter collection 6,84-6,99 t/ha at double-edged usage and 6,93-6,98 t/ha at triple-edged usage (Table 1).

Table 1. Dry matter collection depending on grass mixtures content and usage modes, t/ha

Grass mixture, culture, seeding rate, mln./ha of germinating seeds	Usage mode							
	double-edged				triple-edged			
	2013	2014	2015	average	2013	2014	2015	average
Horned lapwing, 10 + timothy grass, 12 – c.	6,38	7,52	5,30	6,40	6,27	7,35	5,56	6,39
Horned lapwing, 10 + fescue fescue, 2,1	6,99	8,18	5,68	6,95	6,98	8,07	6,35	7,13
Horned lapwing, 10 + fescue fescue, 3,1	6,84	7,76	5,55	6,72	6,93	7,73	6,27	6,98
Horned lapwing, 10 + fairway crested grass, 3	6,22	6,20	4,95	5,79	6,22	6,77	5,21	6,07
Horned lapwing, 10 + fairway crested grass, 4,1	5,99	5,88	4,76	5,54	5,98	6,34	5,17	5,83
Horned lapwing, 10 + smooth bromegrass, 2	5,92	7,79	5,26	6,32	6,35	7,17	5,79	6,44
Horned lapwing, 10 + smooth bromegrass, 2,8	5,54	7,45	5,03	6,01	5,79	7,07	5,29	6,05
HIP (=smallest significant difference) ₀₅	2013	A – 0,19; B – 0,09; AB – 0,28						
	2014	A – 0,23; B – 0,12; AB – 0,31						
	2015	A – 0,17; B – 0,08; AB – 0,26						

Note: (c.) – control.

The fairway crested grass proved to be totally unfit for meadow growing on slopes with acidic and low natural fertility soils. It has fallen out of the herbage completely. In 2014, the grass mixture of horned lapwing and timothy grass (control) provided the outcome 7,52 t/ha of dry matter at double-edged usage. At such a mode of using, the control variant of dry matter output on 0,27 t/ha or 3,6% was exceeded by the grass mixture of horned lapwing, 10 mln ha of germinating seeds with smooth bromegrass, 2 mln/ha of germinating seeds. And the maximum collection of dry matter was provided by grass mixture of horned lapwing with fescue fescue – 8,07-8,18 t/ha.

In 2015, the grass mixture of horn lapwing with timothy grass provided the output of 5,30 t/ha of dry matter at double-edged usage. At such a mode of using, the control variant of dry matter output on 0,38 t/ha was exceeded by the grass mixture of horned lapwing, 10 mln ha with fescue fescue, 2,1 mln/ha. The less productive proved to be the grass mixtures of horned lapwing with smooth bromegrass and fairway crested grass. In 2015, the higher dry mass output was at triple-edged herbage using. Particularly, on control, the dry mass output was on 0,26 t/ha higher than that of double-edged usage. The highest increase was provided by triple-edged usage mode on grass mixture horned lapwing, 10 mln/ha + fescue fescue, 2,1 mln/ha – 0,67 t/ha. In our opinion, this is due to the high part of fescue in botanic composition of third mowing green mass yield, and the better development of this component in autumn period in comparison with timothy grass.

Averagely, in 2013-2015 the maximum dry matter output was provided by the grass mixture horned lapwing, 10 mln/ha + fescue fescue, 2,1 mln/ha at triple-edged mode of using. At increasing the fescue

sowing rate in mixture with horned lapwing up to 3,1 mln/ha of germinating seeds, the mixture productivity was non-significantly decreasing – on 0,15 t/ha. However, this grass mixture also exceeded the control variant (grass mixture of horned lapwing with timothy grass) on 0,59 t/ha. Other grass mixtures (horned lapwing with smooth brome grass and horned lapwing with fairway crested grass) were less productive, compared to control. Hence, in condition of conducting researches, the highest dry matter output was provided by grass mixture of horned lapwing with fescue fescue at triple-edged usage mode.

Determination of green mass yield botanic content showed the good adaptability of fescue fescue to soil-climatic conditions of the research conducting place. So, in average for 2013-2015, the fescue part made 50,8-55,3% in first- and 35,5-36,4% in second mowing at two-times herbage seizure. The part of bean component here made 39,8-44% in first- and 54-56,2% in second mowing (Table 2).

Table 2. Swards botanic content at harvesting on slopes depending on grass mixtures content and using mode (in sum for 2013-2015), %

Grass mixture, culture, sowing rate, mln/ha of germinating seeds; economic-botanic group	Modes of using				
	double-edged		triple-edged		
	1-st mowing	2-nd mowing	1-st mowing	2-nd mowing	3-rd mowing
Horned lapwing, 10 + timothy grass, 12 motley grass	50,5	62,0	56,2	64,8	59,1
	41,0	25,0	37,5	20,4	28,8
	8,5	13,0	6,3	14,8	12,1
Horned lapwing, 10 + fescue fescue, 2,1 motley grass	44,0	56,2	50,9	63,2	48,4
	50,8	35,5	46,3	28,7	48,6
	5,2	8,3	2,8	8,1	3,0
Horned lapwing, 10 + fescue fescue, 3,2 motley grass	39,8	54,0	47,1	57,3	45,0
	55,3	36,4	50,2	33,1	50,5
	4,9	9,6	2,7	9,6	4,5
Horned lapwing, 10 + fairway crested grass, 3 motley grass	63,4	72,8	66,4	71,5	64,8
	-	-	-	-	-
	36,6	27,2	33,6	28,5	35,2
Horned lapwing, 10 + fairway crested grass, 4,1 motley grass	59,8	67,5	62,7	66,7	62,6
	-	-	-	-	-
	40,2	32,5	37,3	33,3	37,4
Horned lapwing, 10 + smooth brome grass, 2 motley grass	47,8	58,9	52,7	62,1	55,7
	44,4	31,2	42,4	28,1	32,7
	7,8	9,9	4,9	9,8	11,6
Horned lapwing, 10 + smooth brome grass, 2,8 motley grass	41,0	47,7	41,5	48,8	47,3
	48,8	36,8	49,2	37,8	37,4
	10,2	15,5	9,3	13,4	15,3

One should note that on the grass mixture of horned lapwing with fescue, the triple-edged mode of use provided better bean component preservation. So, the part of horned lapwing in green mass yield of first mowing made 47,1-50,9%, second mowing – 57,3-63,2%, which is on 6,9-7,3 and 3,3-7% more, compared to double-edged mode of use.

Fairway crested grass proved to be unsuitable for meadow growing on slopes, with acidic soils and soils of low natural fertility. Due to absence of cereal component in botanic content of green mass yield of horned lapwing-fairway crested grass mixture, the part of non-sown species increased sharply – to 27,2-40,2%. Smooth brome grass is characterized by high coenotic activeness and strong suppressing of horned lapwing, compared to other cereal herbs species. This is confirmed by the lowest bean component content in green mass yield exactly in this grass mixture.

Conclusions

In conditions of southern part of western Forest Steppe on slopes with acidic soils with low natural fertility, the most productive one at first three years of usage proved to be the grass mixture: horned lapwing, 10 mln/ha germinating seeds+ fescue fescue, 2,1 mln/ha germinating seeds, which provided the dry mass output 7,13 t/ha at triple-edged herbage using. This is 0,18 t/ha more than that of double-edged mode of use.

On the grass mixture of horned lapwing with fescue fescue, the triple-edged mode of use provided better preservation of bean component. Thus, the part of horned lapwing in green mass yield of first mowing made 47,1-50,9 %, of the second one – 57,3-63,2 %, which is by 6,9-7,3 and 3,3-7 % more, compared to double-edged mode of use. Also, the grass mixture of horned lapwing and fescue was the less contaminated one with motley grass, regardless of the usage mode.

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