RESEARCH ON THE INFLUENCE OF CHEMICAL FERTILIZERS ON TEMPORARY SHORT-EXPLOITATION GRASSLAND

CROITORU IRINA MARINELA*,*CROITORU ALIN, MILUȚMARIUS
University of Craiova, Faculty of Agriculture and Horticulture
e-mail: croitoruimarinela@yahoo.com

Keywords:*mixtures, chemical fertilizers, production*

ABSTRACT

Averaged over the two years of experimentation (2012-2013) separate influence of the mixture of species on short-exploitation temporary grassland production was reduced, meaning that the production of the 4 mixtures were close.

Whatever themixture, theunfertilized variant, consideredcontrol, has been acquiredvery lowproductionof only2.44tha^{-1} d.m. Throughfertilizationwith100 kg/haN(backgroundof 50kg/haP_2O_5 and50 kg/haK_2O) were made5.41t ha^{-1} d.m., which represents an increase of2.97tha^{-1}orin therelative numbersby122%.

The dose of 120 kg/ha N applied in two rounds (80 kg in the spring + 40 kg after first harvest) increased production by 2.08 t ha^{-1}, the amount harvested per unit area being 4.52 t ha^{-1}d.m.

INTRODUCTION

To improve highly degraded grasslands can give good results only radical reconstruction, which consists of grubbing and sowing a seed mixture by perennial forage grasses, in other words, setting up a temporary meadows.

Currently in Europe there is a tendency of using mixtures with small number of species or monocultures, a consequence of high levels of nitrogen fertilization which favors a low number of species, of most production transformation in semisilage and increasing of animals number per unit area(**Vântu V. și colab., 2004**).

An important elementto be taken intoaccountwhen makingmixtures fortemporarymeadowsis theway ofuse ofthe futuregrasslands. Itup mixturesto be usedonly bymowing,grazingonlyorin mixed case. Usuallymixtures exploited ashayare simple,containing2-3species and are sown in arable landfor a short periodof exploitation(2-3years).The other twoaresown to theplaceof permanent grasslanddegraded, onfallowlandand containa totalof 5-6speciesbeingexploited4-6 yearsor more.

Formixtures designed as pastures used by mixed regime should be usedbothhighand medium-sized speciesand withlow height, ensuring abalance betweenfloorsof vegetation.

Currently, when increased requirements for animal products is necessary to intensify fodder production, which can not be achieved only by natural reserves of soil nutrients assimilable. It is necessary to supplement the reserves of nutrients in the soil by applying organic or chemical fertilizers, without which no temporary meadows reveal remarkable productive potential.

In the hills of Oltenia, low soil fertility is a real limiting factor for crop temporary meadows. Therefore, in this area, characterized by very poor and highly acidic soils, fertilizers and amendments are sometimes obligatory for emergence and persistence of eutrophic species by grasses and legumes**(Ionescu I., 2001, 2003)**.

MATERIAL AND METHOD

The experience was placed in the first decade of March in 2012, on a plan area, in subdivided plots with two factors.

Experimental factors were:

Factor A - the mixture with 4 graduations:

- a_1 = *Lolium perenne* + *Trifolium pratense*
- a_2 = *Festuca pratensis* + *Trifolium pratense*
- a_3 = *Lolium perenne* + *Festuca pratensis*
- a_4 = *Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*

In the first three mixtures, each of the two species participated in equal proportion (50% each). In the fourth mixture, the proportion of grasses was of 25% each (total 50%) and 50% of legumes.

For seeding were used following varieties:

- Calibra variety for*Lolium perenne*;
- Laura variety for*Festuca pratensis*;
- Nike varietyfor *Trifolium pratense*.

Factor B - dose of fertilizer, with graduations:

- b_1 = 0 - unfertilized
- b_2 = 100 kg/ha N
- b_3 = 80 kg /ha N in the sprigtime + 40 kg/ha N after first harvest

At the graduations b_2 and b_3 the doses ofnitrogen had the backgroundof 50kg/haP_2O_5 and50 kg/haK_2O.

RESULTS AND DISCUSSIONS

Dry matterproductionaveraged overtwo years(2012-2013)

Averaged over the two years of experimentation (2012-2013) separate influence of the mixture of species on short-exploitation temporary grassland production was reduced, meaning that the production of the 4 mixtures were close (table 1.).

Table 1

Separateinfluenceof the mixtureon the productionofshort-exploitationtemporary meadows from Preajba–Gorj (average 2012-2013,t ha-1 d.m.)

No	Mixture	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	*Lolium perenne* +*Trifolium pratense*	4,46	100	-	Control
2	*Festuca pratensis* + *Trifolium pratense*	4,60	103	0, 14	-
3	*Lolium perenne* + *Festuca pratensis*	3,22	72	- 1, 24	00
4	*Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*	4,23	95	- 0,23	-

DL 5 % = 0,77 t ha^{-1} d.m.; DL 1 % = 1,09 t ha^{-1} d.m.; DL 0,1 % = 1,54 t ha^{-1} d.m

Relative to the amountof dry mattermadefromthe mixturebyLoliumperenne+Trifoliumpratense(4.46tha^{-1}), which is considered a control,the otherthreemixtureswereobtained the followingresults:

-the mixture Festuca pratensis+ Trifolium pratense gave an increase of 3% or, in absolute numbers of 0.14 t ha^{-1}, obviously insignificant, the average being 4.60 t ha^{-1} d.m.;

- mixtures of Lolium perenne + Festuca pratensis and Lolium perenne + Festuca pratensis + Trifolium pratense gave lower yields than the control, of 1.24 t ha^{-1} (distinct significant negative difference) and 0. 23 t ha^{-1} (insignificant negative difference).

As is evident from these data, the three mixtures in which he participated red clover ranged from a quantitative perspective, on a higher plane and very close in terms of productive capacity.

Mixtureconsisting only ofgrasses(Loliumperenne+ Festuca pratensis) proved lessindicated being netdifferingfrom the othersin terms of quantity.

Consequently, in the case of mixtures of short duration, similar to those by medium and long, similar yields are obtained if in the their composition are used species well adapted to the area. This has great practical significance since, facilitates the procurement of seeds, allowing for different formulas, depending on the supply of seed material, with about the same results.

Spectacular differences in the production of short duration grasslands were determined by chemical fertilizers (Table 2).

Table 2

Separate influence of of chemical fertilizers on the production of short-exploitation temporary meadows from Preajba – Gorj (average 2012-2013, t ha^{-1} d.m.)

Nr. crt.	Agrofond (kg ha^{-1})	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	0	2,44	100	-	Control
2	100 N, 50 P_2O_5, 50 K_2O	5,41	222	2,97	***
3	80 N + 40 N,50 P_2O_5, 50 K_2O	4,52	185	2,08	***

DL 5 % = 0,26 t ha^{-1} d.m.; DL 1 % = 0,37t ha^{-1}d.m.; DL 0,1 % = 0,47 t ha^{-1} d.m.

On average, regardless of mixture the unfertilized variant, considered as control, achieved a very low production of only 2.44 t ha^{-1}d.m. Through fertilization with 100 kg / ha N (background of 50 kg / ha P_2O_5 and 50 kg / ha K_2O) were obtained 5.41 t / ha d.m, which represents an increase of 2.97 t ha^{-1}or in the relative numbers of 122%.

The dose of 120 kg/ha N applied in two rounds (80 kg in the spring + 40 kg after first harvest) increased production by 2.08 t ha^{-1}, the amount harvested per unit area being 4.52 t ha^{-1}d.m. At theboth treatments, increasesobtained werevery significant.

Results emphasize theurgent need forfertilizer useas a wayto obtainofnormalyields on very poorand acidicsoilsof theCarpathian areaof Oltenia. It should also bepointed out that use of moderate nitrogendose,springfully applied, gave better resultsthan takingfractional,increasinglyfrequentphenomenonin the area,due to climate changemanifested bylong periodsof droughtaccompanied byhigh temperatures.

Special Efficacy of fertilizers can be better highlighted if we take into account the mixture of species (Table 3).

The table recorded real yields, determined on each variant and not average data, as presented in the two previous tables. From the data it appears that under the 4 mixtures fertilization, without exception, were obtained compared with unfertilized control, very significant increases.They ranged from 1.85 t ha^{-1}and 3.17 t ha^{-1}. For example, the mixture of Festuca pratensis with Trifolium pratense without fertilizers, harvested (average over 2 years) 2.75 t ha^{-1}d.m. Treatment with 100 kg / ha N, 50 kg / ha P_2O_5, 50 kg / ha K_2O increased production by 3.12 t ha^{-1}and treatment with 80 + 40 kg / ha N (background phospho-potassic) with 2.43 t ha^{-1}, yields per hectare being 5.87 and respectively 5.18 t d.m.

In all four mixtures tested growth caused by dose of 100 kg / ha, fully given in spring was superior to treatment with growth recorded when nitrogen was aplied in two rounds.

Table 3

The combined influenceofchemical fertilizers with the mixture on the production of short-exploitation temporary meadows from Preajba – Gorj (average 2012-2013, t ha^{-1}d.m.)

Nr. crt.	Agrofond (kg ha^{-1})	Mixture	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	0	*Lolium perenne* + *Trifolium pratense*	2,88	100	-	Control
2	100 N, 50 P_2O_5, 50 K_2O		5,69	197	3,21	***
3	80 N + 40 N,50 P_2O_5, 50 K_2O		4,82	167	1,94	***
4	0	*Festuca pratensis* + *Trifolium pratense*	2,75	100	-	Control
5	100 N, 50 P_2O_5,50 K_2O		5,87	213	3,12	***
6	80 N + 40 N, 50 P_2O_5, 50 K_2O		5,18	188	2,43	***
7	0	*Lolium perenne* + *Festuca pratensis*	1,67	100	-	Control
8	100 N, 50 P_2O_5, 50 K_2O		4,47	268	2,80	***
9	80 N + 40 N,50 P_2O_5, 50 K_2O		3,52	211	1,85	***
10	0	*Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*	2,46	100	-	Control
11	100 N, 50 P_2O_5,50 K_2O		5,63	229	3,17	***
12	80 + 40 N,50 P_2O_5, 50 K_2O		4,57	186	2,11	***

DL 5 % = 0,53 t ha^{-1} d.m.; DL 1 % = 0,71 t ha^{-1} d.m.; DL 0,1 % = 0,95 t ha^{-1} d.m.

The combined influence of mixture with chemical fertilizers is recorded in Table 4.

Also in this table appear concrete production, harvested on the variants. Statistical calculations showed that within each of the 3 agrofunds differences between the control mixture (Lolium perenne + Trifolium pratense) and the other three mixtures were insignificant, or at the most significant.

Unfertilized Festuca pratensis with Trifolium pratense mixture gave a small negative difference towards the control, 0.13 t ha^{-1}, the other two variants of fertilization (100 + 40 N or 80 N) proved superiority against the witness with 0.18 and respectively 0.36 t ha^{-1}.

The other twomixturesgaveproductionminusesboth tounfertilized and at the twofertilized variants.Note thatin thecase of mixtures ofLoliumperenne+ Festucapratensis, negativedifferencestocontrol mixture wereconsideredsignificant by 1.21 to 1.30t ha^{-1}d.m.

More important are thedifferencesthat can beobserved between theyieldsof the 4mixturesatdifferentgraduations of fertilizerfactorand comparing themwith the calculated valuesof thelimit differences.

Looking at the table it follows that the yields of dry matter of the 12 variants ranged from 1.67 t ha^{-1}(the mixture only with the grass species, unfertilized) and 5.87 t ha^{-1}in mixture Festuca pratensis with Trifolium pratense fertilized with 100 kg / ha N, 50 kg / ha P_2O_5, 50 kg / ha K_2O. Between these two variants there is a remarkable difference very significant: 5.87 - 1.67 = 4.2 t ha^{-1}.

Table 4

The combined influenceofmixture with the chemical fertilizerson the production of short-exploitation temporary meadows from Preajba – Gorj (average 2012-2013, t ha^{-1}d.m.)

Nr. crt.	Mixture	Agrofond (kg ha^{-1})	Yield (t ha^{-1} d.m.)	%	Difference	Significance
1	*Lolium perenne* + *Trifolium pratense*	0	2,88	100	-	Control
2	*Festuca pratensis* + *Trifolium pratense*		2,75	95	-0,13	-
3	*Lolium perenne* + *Festuca pratensis*		1,67	58	-1,21	0
4	*Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*		2,46	85	-0,42	-
5	*Lolium perenne* + *Trifolium pratense*	100 N, 50 P_2O_5, 50 K_2O	5,69	100	-	Control
6	*Festuca pratensis* + *Trifolium pratense*		5,87	103	0,18	**-**
7	*Lolium perenne* + *Festuca pratensis*		4,47	78	-1,22	0
8	*Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*		5,63	99	-0,06	**-**
9	*Lolium perenne* + *Trifolium pratense*	80 + 40 N, 50 P_2O_5, 50 K_2O	4,82	100	-	Control
10	*Festuca pratensis* + *Trifolium pratense*		5,18	107	0,36	**-**
11	*Lolium perenne* + *Festuca pratensis*		3,52	73	-1,30	0
12	*Lolium perenne* + *Festuca pratensis* + *Trifolium pratense*		4,57	95	-0,25	**-**

DL 5 % = 0,89 t ha^{-1} d.m.; DL 1 % = 1,23 t ha^{-1} d.m.; DL 0,1 % = 1,71 t ha^{-1} d.m.

Such differences may be found in this experience, given that six variants have achieved yields of 4-5 t ha^{-1}, very close to the maximum. These are the three mixtures of grass + red clover fertilised with nitrogen along with phosphorus and potassium.

From these datait is clearthe importanceof correct choiceof cultivated mixtures meaning use of specieswell adaptedto the areaandespeciallythe use ofappropriatefertilizationwhich can make the differencebetweena high andlow production, tothe standards of amodern agriculture.

CONCLUSIONS

1. Averaged over the two years of experimentation (2012-2013) separate influence of the mixture of species on short-exploitation temporary grassland production was reduced, meaning that the production of the 4 mixtures were close.

2. On average, regardless of mixture the unfertilized variant, considered as control, achieved a very low production of only 2.44 t / ha d.m.

3. Through fertilization with 100 kg / ha N (background of 50 kg / ha P_2O_5 and 50 kg / ha K_2O) were obtained 5.41 t / ha d.m, which represents an increase of 2.97 t / ha or in the relative numbers of 122%.

4. The dose of 120 kg/ha N applied in two rounds (80 kg in the spring + 40 kg after first harvest) increased production by 2.08 t ha^{-1}, the amount harvested per unit area being 4.52 t ha^{-1}d.m. At theboth treatments, increasesobtained werevery significant.

5. Results emphasize theurgent need forfertilizer useas a wayto obtainofnormalyields on very poorand acidicsoilsof theCarpathian areaof Oltenia. It should also bepointed out that use of moderate nitrogendose,springfully applied, gave better resultsthan takingfractional,increasinglyfrequentphenomenonin the area,due to climate changemanifested bylong periodsof droughtaccompanied byhigh temperatures.

REFERENCES

1. **Ionescu I.**, **2003** – *Pajiştile temporare în zona subcarpatică a Olteniei*, Edit. Sitech, Craiova;

2. **Ionescu I.**, **2001** – *Cultura pajiştilor, curs*, Edit. Sitech;

3. **Ionescu I.**, **2001** – *Pajiştile permanente din nordul Olteniei*, Edit. Universitaria, Craiova;

4. **Pavel C.**, **1973**–*Pajiştile din zonasubcarpaticăaOlteniei*, Edit. ScrisulRomânesc, Craiova;

5. **Vîntu V. şi colab., 2004** – *Cultura pajiştilor şi a plantelor furajere*, Edit. Ion Ionescu de la Brad, Iaşi;