# BEHAVIOR OF A SHORT-TERM GRASSLAND FORMED FROM THE MIXTURE OF LOLIUM MULTIFLORUM AND TRIFOLIUM PRATENSE IN THE SUBCARPATHIAN AREA OF OLTENIA

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**Abstract**

*The paper presents the results regarding the behavior of a grassland sown in the sub-Carpathian area of Oltenia under the influence of the sowing time and the dose and nitrogen fertilization system. A mixture of 50 % Lolium multiflorum + 50 % Trifolium pratense was used. The data obtained clearly show the superiority of the grassland sown in autumn, especially in the case of the use of fertilizers, when increases of 7-8 t/ha are obtained compared to the grassland sown in spring. Within each sowing season, there is a big difference in the annual staggering of production. The annual dynamics were influenced primarily by the presence or absence of fertilizers and to a lesser extent, by the nitrogen administration system.*

***Key words**: **short-term grassland, sowing system, fertilization**.*

## INTRODUCTION

The species Lolium multiflorum (ryegrass aristat) is part of the group of annual grasses, representing an important source of fodder for animals.

Iacob T. et al., (2000) and Vântu V. et al., (2004) present it as a species with high production potential and high nutritional value, 1 kg of dry matter equivalent to 0.8-0.9 UN, with a content of 130-160 g of digestible protein. It is also characterized by high values of consumability and digestibility and by the possibility of being used for long periods, respectively 20-25 days at the first harvest and 15-18 days at the second.

Lolium multiflorum, sown in autumn, offers a very early green fodder and can successfully replace the mixture of herbs, which it greatly surpasses, both quantitatively and qualitatively. In addition, it is a good precursor for successive crops, is a good soil improver and can be easily preserved by silage (Moga I. et al., 1996).

Lolium multiflorum can be grown alone or mixed with a legume, respectively with Trifolium pratense or Trifolium alexandrinum (Alexandria clover).

Regardless of the legume used, the mixed crop can be used for only one year, and it is recommended to harvest by mowing, at short or long intervals depending on the needs.

## MATERIALS AND METHODS

The experience was located on a flat field, at the Preajba Experimental Center, Gorj County.

The experimental protocol consisted of using a mixture consisting of 50 % *Lolium multiflorum* + 50 % *Trifolium pratense*, for which a device was designed in subdivided plots with 2 factors, as follows:

Factor A – sowing time with graduations:

- $a_1$ = spring;
- $a_2$ = autumn.

Factor B – dose and nitrogen fertilization system, with graduations:

- $b_1$ = 0-unfertilized;
- $b_2$ = 30 kg/ha N in spring + 30 kg/ha N after scythes I and II;
- $b_3$ = 50 kg/ha N in spring + 50 kg/ha N after scythes I and II;
- $b_4$ = 100 kg/ha N in spring + 30 kg/ha N after scythe I;

- $b_5$ = 100 kg/ha N in spring + 30 kg/ha N after scythe I + 30 kg/ha N after scythe II.

At grades b2-b5, the nitrogen dose applied in spring was accompanied by 50 kg/ha P2O5, 50 kg/ha K2O.

The following varieties were used: Jeanne for *Lolium multiflorum* and the Nike variety for *Trifolium pratense*.

## RESULTS AND DISCUSSIONS

Regarding the dry matter production, it is observed that the meadow of *Lolium multiflorum* with *Trifolium pratense* from Preajba - Gorj showed a different productive capacity depending on the sowing time (Table 1).

**Table 1.*Separate influence of sowing time on the meadow production of Lolium multiflorum + Trifolium pratense* from Preajba - Gorj (t/ha d.m.)**

| No. | Sowing time | Absolute production (t/ha d.m.) | % | Difference | Significance |
|---|---|---|---|---|---|
| 1 | Spring | 4.37 | 100 | - | Control |
| 2 | Autumn | 11.06 | 253 | 6.69 | *** |

DL 5 % = 1.10 t/ha d.m.
DL 1 % = 2.02 t/ha d.m.
DL 0,1 % = 4.49 t/ha d.m.

If the early spring sowing gave the possibility of harvesting only 4.37 t/ha d.m., the sowing of the two components at the beginning of autumn, in the previous year, resulted in a production of 11.06 t/ha d.m. Consequently, by sowing in autumn, an increase of 153% was obtained, or, in absolute figures of 6.69 t/ha, obviously very significant. These data demonstrate, with maximum certainty, the opportunity to treat mixtures based on *Lolium multiflorum* as autumn crops.

Remarkable production differences, very statistically assured, were also achieved by fertilizers (Table 2).

**Table 2.*Separate influence of nitrogen application system on meadow production of Lolium multiflorum + Trifolium pratense from Preajba-Gorj (t/ha d.m.)***

| No. | Nitrogen application system (kg/ha) | Absolute production (t/ha d.m.) | % | Difference | Significance |
|---|---|---|---|---|---|
| 1 | 0-unfertilized | 4.04 | 100 | - | Control |
| 2 | 30 N in spring + 30 N after C I, II | 8.10 | 200 | 4.06 | *** |
| 3 | 50 N in spring + 50 N after C I, II | 8.67 | 215 | 4.63 | *** |
| 4 | 100 N in spring + 30 N after C I | 8.80 | 218 | 4.76 | *** |
| 5 | 100 N in spring + 30 N after C I, II | 8.94 | 221 | 4.90 | *** |

DL 5 % = 0.83 t/ha d.m.;
DL 1 % = 1.15 t/ha d.m.;
DL 0,1 % = 1.58 t/ha d.m.

In this regard, we mention that compared to the production of the unfertilized control, of 4.04 t/ha d.m., the administration of nitrogen fertilizers together with phosphorus and potassium, increased the production by 100-121 % (4.06-4.90 t/ha d.m.), achieving a quantity of feed per unit area of 8.10-8.94 t s.u.

It should be noted that, on average, regardless of the sowing time, there were no marked differences between the 4 treatments with different doses and fractions of nitrogen fertilizers. In other words, at all 4 treatments, very close yields were obtained, which we consider to be due to the favorable climatic conditions, which allowed the optimal use of fertilizers, including lower doses, applied fractionally.

However, the effectiveness of fertilizers was different, depending on the sowing time (Table 3).

**Table 3.The combined influence of nitrogen application system with sowing time on meadow production of *Lolium multiflorum + Trifolium pratense* from Preajba-Gorj (t/ha d.m.)**

| No. | Nitrogen application system (kg/ha) | Sowing time | Absolute production (t/ha d.m.) | % | Difference | Significance |
|---|---|---|---|---|---|---|
| 1 | 0-unfertilized | Spring | 2.69 | 100 | - | Control |
| 2 | 30 N in spring + 30 N after C I, II | | 4.47 | 166 | 1.78 | ** |
| 3 | 50 N in spring + 50 N after C I, II | | 4.85 | 180 | 2.16 | ** |
| 4 | 100 N in spring + 30 N after C I | | 4.87 | 181 | 2.18 | ** |
| 5 | 100 N in spring + 30 N after C I, II | | 4.96 | 184 | 2.27 | *** |
| 6 | 0-unfertilized | Autumn | 5.39 | 100 | - | Control |
| 7 | 30 N in spring + 30 N after C I, II | | 11.74 | 218 | 6.35 | *** |
| 8 | 50 N in spring + 50 N after C I, II | | 12.49 | 232 | 7.10 | *** |
| 9 | 100 N in spring + 30 N after C I | | 12.73 | 236 | 7.34 | *** |
| 10 | 100 N in spring + 30 N after C I, II | | 12.93 | 240 | 7.54 | *** |

DL 5 % = 1.18 t/ha d.m.
DL 1 % = 1.62 t/ha d.m.
DL 0,1 % = 2.3 t/ha d.m.

In this regard, the productions between 11.74-12.93 t/ha d.m. obtained from the grassland sown in autumn were noted, increasing by 6.35-7.54 t/ha compared to the unfertilized control which registered 5.39 t/ha.

In the case of spring sowing, the production of the fertilized variants oscillated between 4.47 and 4.96 t/ha and the increases compared to the control, between 1.78 and 2.27 t/ha, being mostly distinctly significant.

The data highlight the small quantitative differences between the 4 fertilizer treatments within each sowing season as well as the effectiveness of lower doses of nitrogen, applied fractionally, when the year is favorable from a climatic point of view.

The importance of choosing an appropriate technology can be easily deduced from the analysis of the combined influence of the sowing time with the nitrogen fertilization system (Table 4.).

**Table 4. *Combined influence of sowing time with nitrogen application system on production of meadow Lolium multiflorum + Trifolium pratense from Preajba-Gorj (t/ha d.m.)***

| No | Sowing time | Nitrogen application system (kg/ha) | Absolute production (t/ha d.m.) | % | Difference | Significance |
|---|---|---|---|---|---|---|
| 1 | Spring | 0-unfertilized | 2.69 | 100 | - | Control |
| 2 | Autumn | | 5.39 | 200 | 2.70 | ** |
| 3 | Spring | 30 N in spring + 30 N after C I, II | 4.47 | 100 | - | Control |
| 4 | Autumn | | 11.74 | 263 | 7.27 | *** |
| 5 | Spring | 50 N in spring + 50 N after C I, II | 4.85 | 100 | - | Control |
| 6 | Autumn | | 12.49 | 257 | 7.64 | *** |
| 7 | Spring | 100 N in spring + 30 N after C I | 4.87 | 100 | - | Control |
| 8 | Autumn | | 12.73 | 261 | 7.86 | *** |
| 9 | Spring | 100 N in spring + 30 N after C I, II | 4,.96 | 100 | - | Control |
| 10 | Autumn | | 12.93 | 261 | 7.97 | *** |

DL 5 % = 1,50 t/ha d.m.
DL 1 % = 2,35 t/ha d.m.
DL 0,1 % = 4,20 t/ha d.m.

The table clearly shows the superiority of the grassland sown in autumn, especially in the case of the use of fertilizers, when increases of 7-8 t/ha are obtained compared to the grassland sown in spring.

At the same time, the oscillation of production between very wide limits is evident: from 2.69 t at spring sowing, unfertilized, to almost 13 t/ha d.m. at the autumn sowing season, at fertilization with 100 kg/ha N in spring + 30 kg/ha N after scythe I and scythe II.

High productions of about 12 t/ha were also recorded for the other 3 treatments, also in the case of autumn sowing, which draws attention to the possibilities of using lower doses of fertilizers, which have a double advantage: economic and ecological.

## THE PRODUCTION DISTRIBUTION ON CROPS

The mixture of *Lolium multiflorum* with *Trifolium pratense* was harvested twice when sown in spring and 4 times when sown in autumn (Table 5).

**Table 5.** ***The annual production distribution on crops (%)***

| No. | Sowing time | Sistemul de aplicare a azotului (kg/ha) | Scythe I | Scythe II | Scythe III | Scythe IV |
|---|---|---|---|---|---|---|
| 1 | Spring | 0-unfertilized | 15 | 85 | - | - |
| 2 | | 30 N in spring + 30 N after C I, II | 35 | 65 | - | |
| 3 | | 50 N in spring + 50 N after C I, II | 35 | 65 | - | - |
| 4 | | 100 N in spring + 30 N after C I | 46 | 54 | - | - |
| 5 | | 100 N in spring + 30 N after C I, II | 44 | 56 | - | - |
| 6 | Autumn | 0-unfertilized | 55 | 18 | 13 | 14 |
| 7 | | 30 N in spring + 30 N after C I, II | 60 | 21 | 8 | 11 |
| 8 | | 50 N in spring + 50 N after C I, II | 60 | 21 | 8 | 11 |
| 9 | | 100 N in spring + 30 N after C I | 68 | 21 | 4 | 7 |
| 10 | | 100 N in spring + 30 N after C I, II | 64 | 22 | 7 | 7 |

The meadow sown in spring was mowed twice and the one sown in autumn four times.

So, as a first conclusion, there is a big difference between the two sowing times regarding the annual staggering of production.

Within each sowing season, the annual dynamics were influenced primarily by the presence or absence of fertilizers and, to a lesser extent, by the nitrogen administration system.

In the unfertilized control sown, in spring, the first scythe accounted for 15 % and the second scythe, 85 % of the annual production. At the 4 fertilizer treatments, the first scythe had a share of 35-46 %, and the second scythe, 54-65 % (fig.1).

Consequently,fertilizers determined a much more balanced annual dynamic, contributing to the increase in the participation of the first harvest. In this regard, the two treatments with the first nitrogen fraction, in spring, of 100 kg/ha, were noted.

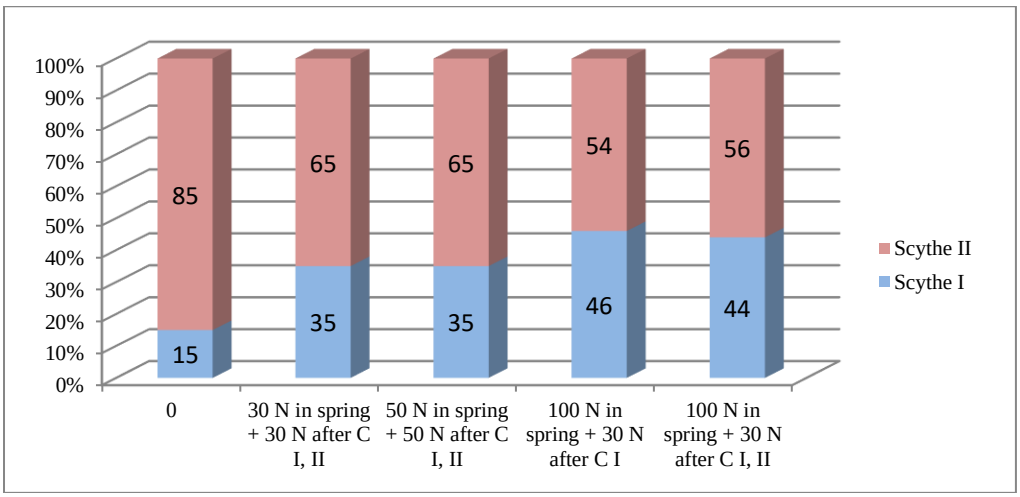


**Fig. 1. Production distribution on sew of a temporary meadow *Lolium multiflorum* + *Trifolium pratense* sown in spring (%)**

At the autumn sowing season, the differences between the unfertilized control and the 4 fertilizer variants were smaller (Figure 2).

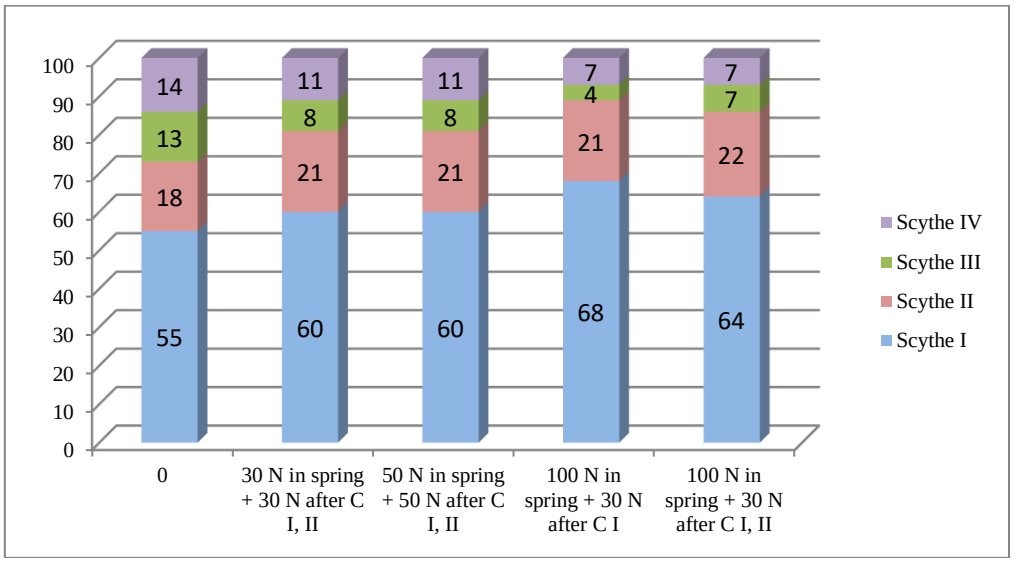


**Fig. 2. Production distribution on sew of a temporary meadow *Lolium multiflorum* + *Trifolium pratense* sown in autumn (%)**

Thus, for example, in the first scythe, the share of the production of the control variant was 55%, and of the 4 nitrogen variants, of 60-68%. In the same sense, there were differences in the second scythe: a lower share, of 18% for unfertilized and a higher one, of 21-22% for the 4 nitrogen treatments. On the other hand, in the third and fourth scythes, while in the control the weight of production represented 13-14 %, in the treatments, it oscillated between 4-11 %.

In conclusion, even in the conditions of a favorable year, with abundant and relatively well-distributed rainfall, a well-balanced annual dynamic cannot be achieved, but it can only improve. Nitrogen doses administered in spring and after the first harvest are useful, which really contribute to increasing production, the other fractions (after the second scythe, possibly the third) not having a noticeable influence. In fact, the annual dynamics show that 80-90% of the production is obtained from the first two scythes, while at the last two harvests, a much smaller quantity, of 10-20%.

Consequently, under the conditions of fertilization with nitrogen administered in two stages, i.e. in spring and after scythe I, two quantitatively important harvests are possible, after which the crop can be dismantled and corn sown.

## CONCLUSIONS

1. Sowing the mixture in late summer-early autumn ensures important dry matter yields, 2-3 times higher than sowing in spring.

2. The use of chemical fertilizers with nitrogen (on a phospho-potassium background) is necessary and mandatory to enhance the productive potential of the component species: *Lolium multiflorum* + *Trifolium pratense*. The use of fertilizers doubles the production of dry matter compared to unfertilized.

3. Through fertilization, yields of 4-5 t/ha d.m. are obtained for the meadow sown in spring and 11-13 t/ha d.m. for the meadow sown in autumn.

4. The productive capacity of short-term grassland consisting of 50 % *Lolium multiflorum* + 50 % *Trifolium pratense* fluctuates within very wide limits depending on the sowing and fertilization time: from 2.69 t/ha (sown in spring, unfertilized) to 12.93 t/ha (sown in autumn, fertilized with 100 kg/ha N in spring + 30 kg/ha after scythes I and II). High yields, close to the maximum, are also achieved when fertilizing with 50 kg/ha N in spring + 50 kg/ha after scythes I and II, under the conditions of sowing in autumn.

5. The mixture of ryegrass with red clover sown in spring yielded only 2 scythes, while sown in autumn 4 harvests.

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