

RESEARCHES REGARDING THE PROMOTION OF SIMPLE MIXTURE OF *PHALARIS ARUNDINACEA* WITH *MEDICAGO SATIVA*

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Abstract

The research was carried out at Grassland Research Institute Brașov, in the period 2009-2011, on a sandy loam chernozem soil. Biological material is composed by two simple mixtures: *Dactylis glomerata* + *Medicago sativa*, *Phalaris arundinacea* and *Medicago sativa*. The highest production obtained after fertilization with different nitrogen doses ($N_0P_{22}K_{42}$, $N_{50}P_{22}K_{42}$, $N_{100}P_{22}K_{42}$), was registered by *Phalaris arundinacea* + *Medicago sativa* mixture. Dry matter production increased proportionally with doses of fertilizer applied. Chemical analysis has showed that *Phalaris arundinacea* + *Medicago sativa* mixture has a content of 1313 kg / ha of crude protein, at dose $N_{100}P_{22}K_{42}$ increased by 4.1% compared the mixture of *Dactylis glomerata* + *Medicago sativa*, which at the same dose fertilization obtained 1261 kg / ha crude protein. Lignin content (ADL) is recorded with values less than 7% (best) at both mixtures on the three levels of fertilization.

Keywords: *Phalaris arundinacea*, *Medicago sativa*, *Dactylis glomerata*, simple mixtures, fertilization

INTRODUCTION

Simple grassland mixture between a grass and a leguminous used for improving forage quality have a long practice. So, there are mixture recommended for different areas as well for our country as for Europe. Culture of perennial grass and legumes mixtures have several advantages: high productivity due to usage of ecological niches in that biotope, high yields of protein due to presence of legumes, and increasing the protein content of grasses in the presence of legumes,

economy of nitrogen based fertilizer, due to fixing nitrogen from the atmosphere by the bacterial genus of *Rhizobium* sp. (Stefan, 1999). *Dactylis glomerata* is a very popular species in our country and is one of the most valuable grasses (Moga, 1996). This species is establish, as participation in mixtures with legumes. *Phalaris arundinacea* species is very resistant at continues changing conditions of environment, it represents a future

for obtain the forage in our country, in different conditions, flood areas, periods of drought, etc. (Marusca, 1985; Samfira, 2001). For this reason, in this study we chose simple mixture of *Dactylis glomerata* + *Medicago sativa*, a consecrated mixture, whose

benefits are known, for comparing with a new mixture, not studied in our country *Phalaris arundinacea* + *Medicago sativa*.

Both have been studied in the same stationary conditions, and at the same levels of fertilization.

MATERIALS AND METHOD

The research was carried out at Grassland Research Institute Brasov, during 2009 -2011 on a sandy loam chernozem soil, pH 6.5 well supplied with phosphorus 109 ppm and potassium 361 ppm. The annual average temperature was 8.6 °C and the annual average rainfall of 688 mm.

The two factors studied are:

Factor A: Simple mixtures

1 - *Dactylis glomerata* (50%) + *Medicago sativa* (50%)

2 - *Phalaris arundinacea* (50%) + *Medicago sativa* (50%)

Factor B: Level of fertilization

1 - N₀P₂₂K₄₂, kg / ha

2 - N₅₀P₂₂K₄₂, kg / ha

3 - N₅₀₊₅₀P₂₂K₄₂, kg / ha

The biological material used is *Dactylis glomerata* Regent 15 kg / ha, *Phalaris arundinacea* Premier 10 kg / ha and *Medicago sativa* La Bella Campagniola 10 kg / ha and 50% grasses with 50% legumes. The exploitation mode was as hayfield, and were harvested three annual sews. Determinations were made regarding dry matter production and chemical composition of forage. The processing and interpreting of data, in terms of statistical synthesis, was performed annually in the period of experimentation 2009-2011 (Tod, 2011).

RESULTS AND DISCUSSION

Dry matter production

Dry matter production obtained in the 2-year average is 9.83 t / ha in mixture of *Dactylis glomerata* + *Medicago sativa*, with 1.26 t / ha DM less than *Phalaris arundinacea* + *Medicago sativa* mixture how obtained 11.07 t / ha DM (figure 1). Fertilization level has a great influence on the

production of dry matter. The maximum dry matter production is 12.27 t / ha and has been obtained at fertilization N₁₀₀, with 3.46 t / ha DM, more than a witness. (N₀P₂₂K₄₂), who obtained 8.81 t / ha DM. At the N₅₀ has been obtained an average of 10.27 t / ha DM (figure 2).

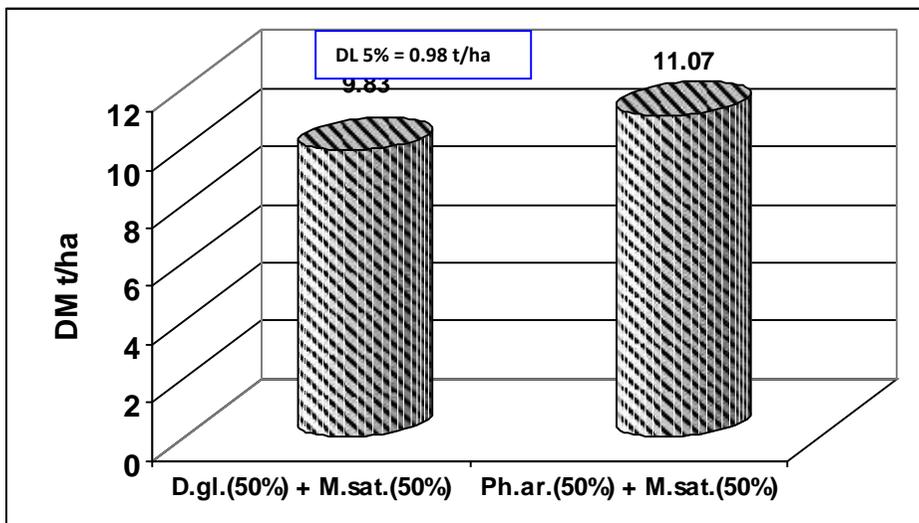


Fig. 1. The influence of mixtures on dry matter production (mean years)

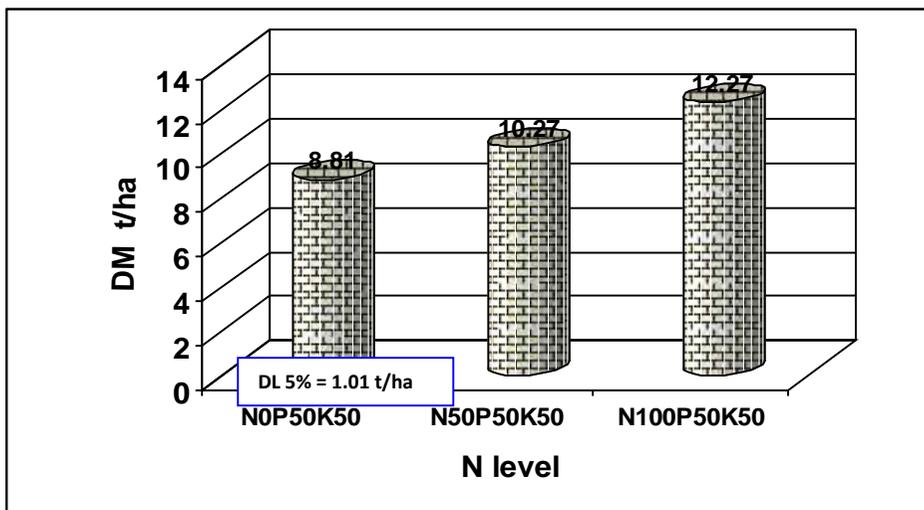


Fig. 2. The influence of fertilizers on dry matter production (mean years)

In the interaction between dose of fertilizer and mixture, the dry matter production increases with dose of fertilizer, it is increasing by

one about 2 t / ha DM in each fraction of 50 kg of nitrogen applied (figure 3).

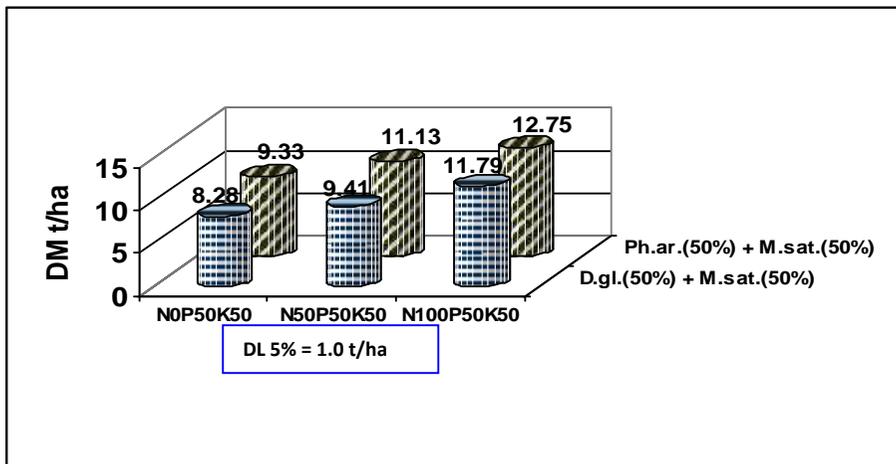


Fig. 3. Influence of interaction between mixtures and dose of fertilizer (mean years)

Mixture that consists of *Phalaris arundinacea* species is superior in terms of dry matter production on all three levels of fertilization, to the *Dactylis glomerata* + *Medicago sativa* mixture.

Highest yields of forage are obtained at N100, by 12.75 t / ha DM, at *Phalaris arundinacea* + *Medicago sativa* mixture and

11.75.t/ha DM at *Dactylis glomerata* + *Medicago sativa* mixture.

To study relationship between fertility and production of DM was used a parabolic shape function $y = ax^2 + bx + c$. Correlation between the dose of nitrogen and production of DM in the two years, is very close, ($R^2 = 0.99$; figure 4).

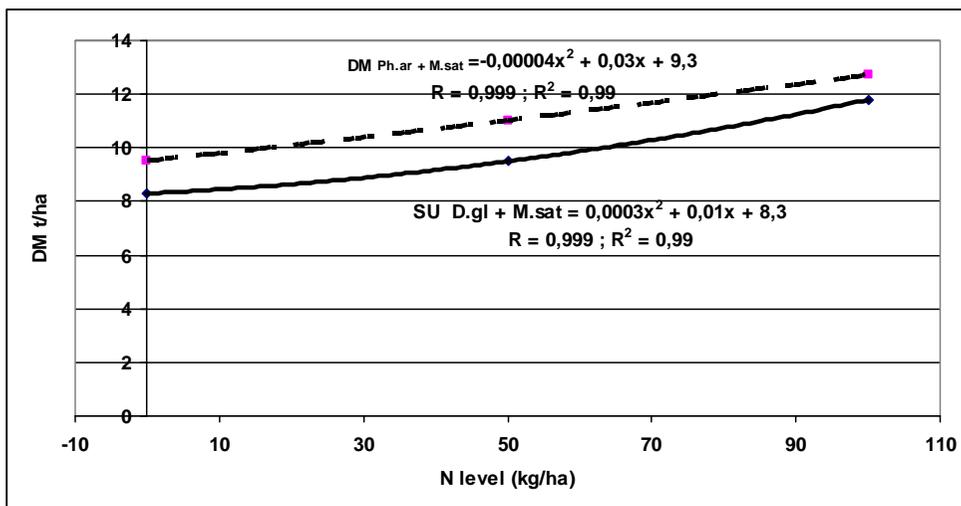


Fig.4. The sum cut of mixture (average years)

Phalaris arundinacea + *Medicago sativa* mixture obtained higher production, the curve evolves almost linearly, increasing the dose of fertilizer.

So this forage mixture provide a higher production than the *Dactylis glomerata* + *Medicago sativa* mixture. Differences of dry matter are smaller at doses N0 and N100.

The forage quality

The forage quality is determined by the complexity of technology for growing various feed structures has great importance on animal nutrition. For temporary pastures, forage quality

is greatly influenced by floral structure of mixtures of species, including legumes who play an important role in achieving a nutritionally balanced in fodder (table1).

Table 1

The value of quality indices, first cut

Mixture	N level	CP %	Ash %	Fibre %	ADF %	ADL %	NDF %	DMD %	OMD %
<i>Dactylis glomerata</i> + <i>Medicago sativa</i>	N ₀ P ₂₂ K ₄₂	10.7	8.6	34.0	35.7	3.8	58.4	58.9	58.2
	N ₅₀ P ₂₂ K ₄₂	11.4	9.4	32.4	34.7	3.7	56.6	60.2	60.0
	N ₁₀₀ P ₂₂ K ₄₂	12.4	9.6	31.5	33.7	3.6	54.3	62.9	61.5
<i>Phalaris arundinacea</i> + <i>Medicago sativa</i>	N ₀ P ₂₂ K ₄₂	9.9	8.9	37.2	38.9	4.0	63.4	58.0	54.4
	N ₅₀ P ₂₂ K ₄₂	10.9	9.2	34.6	36.5	3.8	59.4	59.8	57.6
	N ₁₀₀ P ₂₂ K ₄₂	11.4	9.5	33.9	35.7	3.8	57.1	59.8	58.1

Crude protein content is between 10.7% and 12.4% at *Dactylis glomerata* mixture with *Medicago sativa*, and between 9.9% and 11.4% for *Phalaris arundinacea* mixture with *Medicago sativa*.

Lignocellulose (ADF), increased at variants mixture sown with *Dactylis glomerata* and *Medicago sativa*, depending on the

dose of fertilizer, and *Phalaris arundinacea* with *Medicago sativa* mixture it had a higher value of lignocellulose at dose N₅₀P₂₂K₄₂.

Lignin content (ADL) is part of the cellular constituents of plants indigestible in the rumen of animals, and is recorded with values less than 7% (optimal) at both mixtures on the three levels of fertilization.

Ash content increased by 1% at N₁₀₀P₂₂K₄₂ dose applied at *Dactylis glomerata* with *Medicago sativa* mixture, from variant not fertilized with nitrogen. This increase was registered for the second mixture too, but in a smaller percentage (just 0.3%). Total fiber content (NDF) is recorded between optimal values (44-55%) only with the mixture of *Dactylis glomerata*, *Medicago sativa*, at dose of N₁₀₀P₂₂K₄₂ the other two doses were more than

optimal (56.6% and 58, 4%). *Phalaris arundinacea* with *Medicago sativa* mixture exceeds optimal NDF on all three levels of fertilization. Organic matter digestibility (OMD) and dry matter digestibility (DMD), decreases with increasing dose of nitrogen in both mixtures.

From chemical analysis data presented in table 2, at second cut, the forage has a slight improvement in increasing quality at main indices.

Table 2

The value of quality indices second cut

Mixture	N level	CP %	Ash %	Fibre %	ADF %	ADL %	NDF %	DMD %	OMD %
<i>Dactylis glomerata</i> + <i>Medicago sativa</i>	N ₀ P ₂₂ K ₄₂	10.7	10.0	34.3	37.0	2.9	65.3	59.5	56.8
	N ₅₀ P ₂₂ K ₄₂	12.4	10.7	32.1	35.6	3.1	63.5	62.1	59.8
	N ₁₀₀ P ₂₂ K ₄₂	13.2	11.1	32.5	45.2	3.3	63.9	43.6	58.1
<i>Phalaris arundinacea</i> + <i>Medicago sativa</i>	N ₀ P ₂₂ K ₄₂	9.7	9.6	35.6	37.8	3.4	64.4	57.9	56.0
	N ₅₀ P ₂₂ K ₄₂	11.5	10.0	35.1	40.7	3.4	63.2	59.7	56.0
	N ₁₀₀ P ₂₂ K ₄₂	11.2	9.9	33.6	35.9	3.4	60.7	60.0	56.9

Crude protein content is higher than at first cut in both mixtures. Crude protein content at *Dactylis glomerata* with *Medicago sativa* mixture it increases with increasing dose of nitrogen. For the second mixture the content in crude protein was largest recorded in N₅₀P₂₂K₄₂ with a value of 11.5%. Lignin content (ADL), present smaller values than the first cut. Between the two mixtures the *Dactylis glomerata* has a lower lignin content. and this increases by 0.4% from the dose without nitrogen, at maximum dose of nitrogen applied. To *Phalaris*

arundinacea with *Medicago sativa* mixture lignin content is 3.4% regardless of dose of fertilizer applied.

Total fiber content (NDF) is over 60% at both mixtures. Organic matter digestibility (OMD) and dry matter digestibility (DMD) have lower values than at the first cut. Highest yields of crude protein per hectare were obtained at fertilization level N₁₀₀P₂₂K₄₂, namely 1261 kg / ha CP, at *Dactylis glomerata* + *Medicago sativa* mixture, and 1313 kg / ha CP at *Phalaris arundinacea* + *Medicago sativa* mixture (table 3).

Table 3

Crude protein (CP) content of the three levels of fertilization (kg / ha)

N level	<i>Dactylis glomerata</i> + <i>Medicago sativa</i>	<i>Phalaris arundinacea</i> + <i>Medicago sativa</i>	%
N ₀ P ₂₂ K ₄₂	1060	1055	99.5
N ₅₀ P ₂₂ K ₄₂	1120	1191	106.3
N ₁₀₀ P ₂₂ K ₄₂	1261	1313	104.1
Mean	1147	1186	103.4

At level fertilization without nitrogen, crude protein yields was very close, the mixture with *Dactylis glomeata* obtaining a production of 1060 kg / ha and the mixture with *Phalaris arundinacea* obtained a lower production by 0.5 respectively 1055 kg / ha PB.

From the three levels of fertilization was obtained an average production of crude protein, by 1147 kg / ha CP at *Dactylis glomerata* + *Medicago sativa* mixture, and 3.4% more than *Phalaris arundinacea* + *Medicago sativa*, 1186 kg / ha.

CONCLUSIONS

Cultivated variants with *Phalaris arundinacea* + *Medicago sativa* simple mixture and fertilized with N 100 dose has obtained

production than 12.7 t / ha with 5 t DM / ha more than the variant not fertilized with nitrogen. *Phalaris arundinacea* + *Medicago sativa*,

mixture is superior in terms of production, at *Dactylis glomerata* + *Medicago sativa* mixture.

Highest production of crude protein per hectare were obtained in the fertilization level N₁₀₀P₂₂K₄₂, namely 1313 kg / ha CP at *Phalaris*

arundinacea mixture + *Medicago sativa*. *Phalaris arundinacea*, mixed with a perennial leguminous, can be an alternative to those temporary meadows where no suitable established mixture.

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