INFLUENCE OF FERTILISATION AND CLIMATE ON YIELD EVOLUTION OF TEMPORARY GRASSLAND FROM WESTERN ROMANIA (CASE STUDY)

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Abstract: *Seeded grasslands are used to perform a competitive farming. The meaning of temporary grassland is to provide high and qualitative forage yields with the proper inputs, to prevent the increase of the costs of forage obtained. The purpose of this work is to show how the fertilisation and climate has influenced the fresh fodder yield obtained during the research period. Material studied in this work is represented by two temporary grasslands from Grădinari (175 ha) and Ticvaniu Mare (230 ha) (Caraş-Severin County, Romania). The temporary grasslands analysed in this work were seeded at the end of August 2003, after a mixture of spring oat and pea harvested for fresh fodder. The data were collected from 2004 to 2008. The mixture seeded comprises 6 grasses (Poa pratensis – 15%; Festuca pratensis – 10%; F. rubra – 10%; Dactylis glomerata -15%; Phleum pratense – 10%; Lolium perenne – 15%) and 2 legumes (Trifolium repens – 15%; Medicago sativa – 10%). The climatic data were registered at Meteorological Station Oravița placed at 16 km from Tigvaniu Mare and 12 km from Grădinari. The climatic parameters analysed in this work are annual averages of: air temperature, soil surface temperature, and rainfall amount and relative air humidity. Forage samples were weighted directly in field and then was calculated the average yield per hectare. The statistical analysis used is linear regression and correlation coefficient (r). The evolution of the floristic composition of sward was analysed using Braun-Blanquet (1964) method. The influence of climate and nitrogen fertilisation is different from a year to other, the fresh fodder yield being mostly influenced by the amount of rainfall and air humidity.*

Key words**:** *temporary grassland, yield, mixture, fertilization, climate*

INTRODUCTION

Seeded grasslands are used to perform a competitive farming, being placed in arable land or are replacing much degraded grasslands. The meaning of temporary grassland is to provide high and qualitative forage yields with the proper inputs, to prevent the increase of the costs of forage obtained. In this way is important to balance the fertilisers amounts applied to prevent their leaching through the soil.

Many times farmers are applying high doses of nitrogen on temporary grasslands. In conformity with CAMERON & WILD (1984), in the soil of the temporary grassland about 100 kg N ha-1 is leached in the aquifer layer determining its pollution with nitrates.

ERIKSEN (2001) said that the management of temporary grassland had little effect on the subsequent nitrate leaching (6 to 36 kg N/ha in unfertilized plots).

NEVENS & REHEUL (2003), comparing permanent grassland with a temporary one has concluded that temporary grasslands produced as much as the permanent grassland without the necessity to apply higher amounts of fertilizer N during their 3-year lifetime.

In conformity with CLAYTON *et al.* (1997) the temporal pattern of nitrogen losses applied on grassland is different for the different fertilisers and between years.

After GEYPENS *et al*. (2000) N-fertilisation may sometimes be increased for some fields, whilst for others a decrease of the N-fertilisation may be possible without loss of yield. This can be done by taking into account N delivery capacity and probably also water delivery capacity, N fertiliser recommendations can be tuned to the specific characteristics of a field.

Comparing the yield obtained from permanent and temporary grassland fertilised with the same doses, HOPKINS *et al*. (1990) cited de PEETERS *et al.* () showed that the yields of the two types of sward were nearly identical up to a fertilisation of 200-300 kg N/ha.

MATERIAL AND METHODS

The goal of this research is to highlight the influence of nitrogen fertilisation and of some climatic parameters on the fresh fodder yield of two temporary grasslands.

Material studied in this work is represented by two temporary grasslands from Grădinari (175 ha) and Ticvaniu Mare (230 ha) (Caraş-Severin County, Romania). These surfaces were seeded in August 2003 in arable land after a mixture of spring oat and pea harvested as fresh fodder.

The data were collected during 2004-2008 period. Soil pH is 6.24 in Gradinari and 6.20 in Tigvaniu Mare. The dominant relief formations in the studied area are hills.

The mixture seeded is composed from *Poa pratensis* – 15% - Po. p.; *Festuca pratensis* – 10% - F. p.; *F. rubra* – 10% - F. r.; *Dactylis glomerata* -15% - D. g.; *Phleum pratense* – 10% - Ph. p.; *Lolium perenne* – 15% - L. p.; *Trifolium repens* – 15% - T. r.; *Medicago sativa* – 10% - M. s.).

The climatic data were registered at Meteorological Station Oravița placed at 16 km from Tigvaniu Mare and 12 km from Grădinari. The climatic parameters analysed in this work are annual averages of: air temperature, soil surface temperature, and rainfall amount and air humidity. There were used annual values because the analysed temporary grasslands are perennial crops, there being important the climatic factor from the entire year.

The yield was determined in two harvests per year. The harvested forage was weighted directly in field and then was calculated the average yield per hectare.

For the statistical analysis there was used the linear regression and correlation coefficient (*r*).

Also, it was determined the evolution of the floristic composition of sward using the BRAUN-BLANQUET (1964) method cited by ARSENE (2003).

RESULTS AND DISCUSSIONS

The fresh fodder yield obtained from the two temporary grasslands analysed here has registered the greatest values in the second and third year of vegetation (Tigvaniu Mare: 21.15 t/ha; Grădinari: 15.5 t/ha) (figure 1).

Analysing the linear regression and the correlation coefficient between fresh fodder yield and nitrogen dose applied (figure 2) the obtained r value was -0.31, showing that between these two variables wasn't any correlation during the research period.

The correlation between the fresh fodder yield obtained and the annual mean of air temperature value was $r = -0.61$ showing that the decrease of the annual mean of air temperature determinates the increase of the temporary grassland fresh fodder yield (figure 3). Another thermal parameter, respectively the annual mean of soil surface temperature, shows a negative correlation with the fresh fodder yield ($r = -0.71$) as is shown in figure 4.

Annual rainfall amount have a positive correlation with the fresh fodder yield ($r = 0.66$) showing that the increase of the annual rainfall amount determinates the increase of fresh fodder yield in the case of the analysed temporary grasslands (figure 5).

The correlation coefficient between the fresh fodder yield of the seeded grasslands and the annual mean of the relative air humidity show a positive correlation (*r = 0.63*) evidencing that the increase of the air humidity determinates the increase of fresh fodder yield (figure 6).

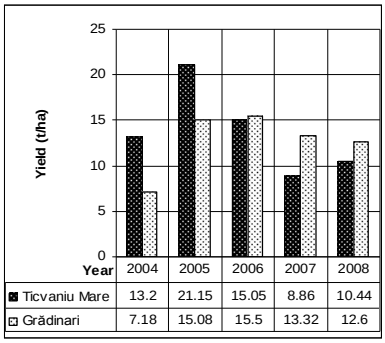

Fig. 1. Fresh fodder yield of analysed temporary grasslands

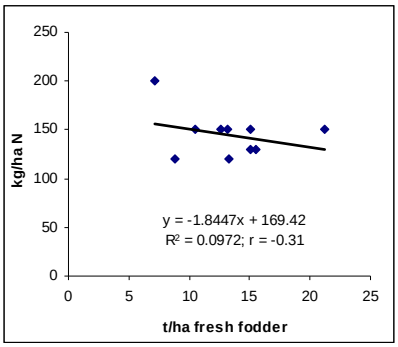

Fig. 2. Linear regression between fresh fodder yield and N dose applied

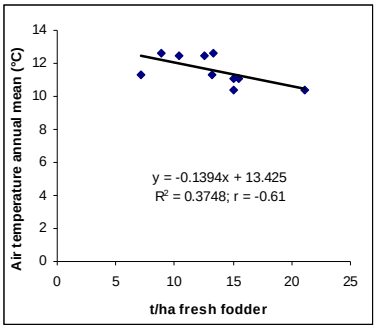

Fig. 3. Linear regression between fresh fodder yield and air temperature

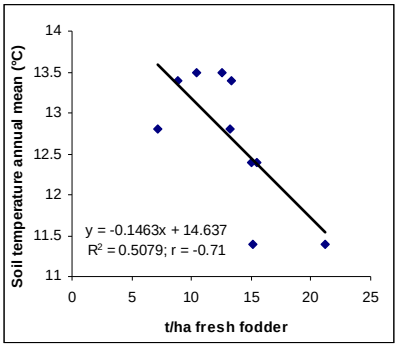

Fig. 4. Linear regression between fresh fodder yield and soil temperature

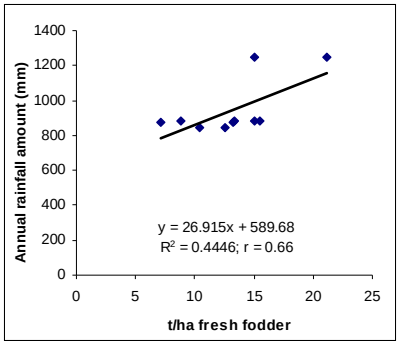

Fig. 5. Linear regression between fresh fodder yield and annual rainfall amount

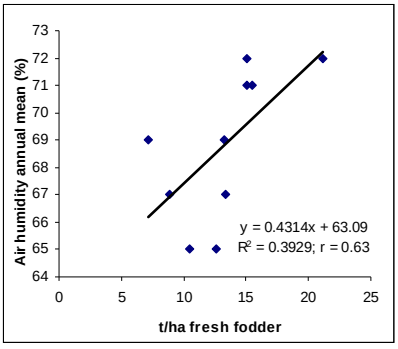

Fig. 6. Linear regression between fresh fodder yield and air relative humidity

The evolution of the floristic composition of the sward during the studied period is represented in table 1. The greatest abundance values are determined for *L. perenne* in the first

year of vegetation with a decrease trend in the next years. *D. glomerata* has in the third year the greatest percentage. In the fourth vegetation year the most abundant species is *Ph. pratense*, and in the fifth *P. pratensis*. Legumes have a continuous decrease in the vegetation cover. Similar results for legumes and *D. glomerata* were obtained by NYFELER *et al*. (2009) too.

Table 1

Evolution of the floristic composition of the temporary grasslands sward

Site	Year	Coverage (%)	Abundance (%)							
			Po. p.	F. p.	F. r.	D. g.	Ph. p.	L. p.	T. r.	M. s.
Tigvaniu Mare	**2004**	90	2	6	4	12	6	35	12	15
	2005	100	6	9	5	14	15	21	17	13
	2006	95	15	13	4	20	16	12	9	6
	2007	80	11	9	7	12	23	7	6	5
	2008	85	22	16	12	9	15	7	3	1
Grădinari	**2004**	75	1	5	1	11	4	32	9	12
	2005	95	7	13	4	12	16	19	13	11
	2006	95	9	8	6	25	22	15	6	3
	2007	90	13	12	10	19	21	9	3	3
	2008	85	17	11	13	11	12	6	4	1

The vegetation coverage has an evolution comparable with the yield, the highest values being determined in the second and the third year of vegetation. This parameter of the vegetation cover was 100 % in 2005 in temporary grassland from Ticvaniu Mare.

Also, there have appeared a series of weeds, the most frequent being the following: *Rubus caesius*, *Cirsium arvense*, *Conyza canadensis*, *Apera spica-venti* and *Bromus hordeaceus.*

CONCLUSIONS

Having in view that the mixture seeded on the temporary grasslands contains 20 % of legumes (*T. repens* and *M. sativa*), these species haven't responded well to the applied nitrogen doses. It wasn't demonstrated an important influence of nitrogen fertilisation on the fresh fodder yield of the temporary grassland analysed here, the greatest influence being due to the climate. There is recommended to reduce the nitrogen dose applied on temporary grassland to diminish the potential pollution of the underground water layer by the nitrates leaching.

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