DYNAMICS OF TMS INDICATOR UNDER INFLUENCE OF FERTILIZATION IN *DACTYLIS GLOMERATA* (DACGLO)

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Abstract: *The dry matter content (TMS) is considered to be the best indicator of the specific growth speed (Weiher et al., 1999; Ryser, 1996) and of resource utilization (Peter et al.,1999), better than SLA. Ryser and Lambers (1995) observed that a low tissue density in Dactylis glomerata is the main character responsible for the rapid growth of this species. TMS also allows the assessment of the mean time of resource resistance in the plant (Echstein et al., 1999). Peter et al. (1999) consider that TMS is also a very practical indicator because it does not necessitate the measurement of the foliar surface. The purpose of this paper is to put in evidence the utilization way of the complex mineral fertilizers, in different areas, through TMS indicator, in species Dactylis glomerata (DACGLO), a dominant species in the permanent grassland of Poiana Braşov, where the experimental field was placed. Beyond information regarding the physiology of species and of vegetal communities, the biological characters allow the assessment of the agronomical features of the plants. The foliar biometric measurements were realized in the laboratory for a number of 10 individuals of Dactylis glomerata/plot. The obtained biological material was put in plastic glasses for re-hydration approximately 6 hours, after a preliminary sectioning of the steam basis of each plant. The plants had been pulled out by turns and after that was started the sampling of the foliar blade, the last sampled being the ligula. Further, there was determined the length (mm), the green mass (g) and the dry mass (g). In the paper we presented the analysis of some morphological features (LgL – the length of the foliar blade, MV – the green mass of the foliar blade, SU – the quantity of dry substance at foliar level) which allowed the determination of TMS indicator – indicator of the SU/MV ratio in the species Dactylis glomerata (DACGLO), dominant within the experimental field, FLD – long term fertilization – in a permanent grassland from Poiana Braşov, Romania. Analyzing the TMS indicator could be observed that it decreases in an environment with higher fertility (V6 - N 240 $P_2 0_5$ 96 K_2O 240) in the species DACGLO, basing on MV increasing and SU decreasing. Dactylis glomerata is a species which responds very well to fertilization, adopting a capture strategy, characterized by a lent recycling of the vegetal organs, with precocious phenology and with medium aptitudes for grazing.*

Key words**:** *Dactylis glomerata, dry matter content, green mass of the leaf blade, quantity of dry substance at foliar level, leaf blade length*

INTRODUCTION

In long term factorial devices, in Romania and other countries too, there was observed very contrasting dynamics of the botanical composition as a result of fertilization and exploitation practices. Analysis of the global botanical composition and of the trajectories followed by it is not always sufficient to functionally characterize the changes in vegetation and the consequences regarding the utilization value.

The transition to a functional description of the vegetation can be approached by analyzing the biological features of the dominant species, especially those concerning the morphology and the chemical composition of the aerial organs. However, these features not allow a direct determination of the physiological functionality of the plant, but they can be selected to highlight, in as much possible correct way, certain functional aspects.

The dry matter content (TMS) represents the ratio between dry matter mass and green matter mass water saturated, and it is a foliar feature largely used in grassland research. However, in the scientific literature, the functional interpretation of this indicator is less developed than that for SLA.

TMS is considered to be the best indicator of the specific growth speed (WEIHER et al., 1999; RYSER, 1996) and of resource utilization (PETER et al.,1999).

RYSER and LAMBERS (1995) found that a low tissue density in *Dactylis glomerata* is the main character responsible for the rapid growth of this species. TMS also allows the assessment of the mean time of resource resistance in the plant (ECHSTEIN et al., 1999). PETER et al. (1999) consider that TMS is also a very practical indicator because it does not necessitate the measurement of the foliar surface.

MATERIAL AND METHODS

The experiments had been realized within a permanent grassland from Poiana Braşov belonging to the Research and Development Institute for Grasslands Braşov. In long term factorial devices, in Romania, there was observed very contrasting dynamics of the botanical composition as a result of fertilization practices.

The experimental field FLD (long term fertilization) has been settled in a permanent mountain grassland (Poiana Braşov) placed at 1000 m altitude. These devices vise to pursue the effects caused by certain combinations of mineral fertilizers, in different amounts and extended exploitation conditions (two mowing actions per year). The device consists of 8 treatments (variants) of mineral fertilization applied on plots by 24 m^2. For each treatment there are 4 replicates, distributed in four blocks; for this paper there are of interest the variants V1, V3 and V6.

The study of TMS indicator in the species *Dactylis glomerata* was made only within the variants: V1 – Control; V3 – $N_{60}P_2O_5$ 24 K_2O 60, and V6 – N 240 P_20_5 96 K_2O 240. The fertilizers with P and K had been applied in autumn, and the fertilizers with N in spring.

The observations and the biometric measurements had been realized in June-September 2002-2004. The species selection (in our research field the species *Dactylis glomerata*) for measurements had been made basing on specific composition (CS %) calculated by relating to the whole vegetal cover.

From each plot there were taken 10 individuals of *Dactylis glomerata* to be measured and sampled. From each plot there were randomly selected plants, representative individuals, as possible in the first phases of vegetation. After the basis sectioning of each individual and transport in the laboratory, the sampling has been started.

There were determined: the length of the leaf blade (mm) with a gradate band; the green mass (g) with a precision balance, the foliar surface (cm) by scanning and image analysis with a computer soft Olympus and the dry mass (g) after 48 h in drying oven , at 70 C, using the same balance.

To facilitate the ulterior utilization of the species *Dactylis glomerata* there was used a code consisting of six letters of this species name – DACGLO (*Dactylis glomerata*).

To facilitate the terminology usage, there were further selected the following abbreviations: L – Leaf blade, the length of the foliar blade; MV – the green mass of the leaf blade; SU – dry matter content of the leaf blade; TMA – indicator regarding the dry matter content (SU/MV). The interpretation of the results was made using the variance analysis.

RESULTS AND DISCUSSIONS

Before the statistical analysis of data and their graphical representation there was selected the species *Dactylis glomerata* that appears in all studied variants within the

experimental field FLD, in order to observe in parallel the way that this species responds to fertilization. As well, the species selection was made tacking into account a very important indicator, respectively the CS% (specific contribution), which stays at the basis of the studied species selection. This type of parallel analysis was applied also with the purpose to make observations using the concept of functional types of species (TFS).

Further, there will be realized a presentation under the aspect of the way that the main production characters and features are changing under the influence of fertilization in the species *Dactylis glomerata.*

Utilization of the foliar features is important, to avoid the "plant performances" under the influence of different amounts of fertilizers. Thus, one of the analyzed features is the length of the leaf blade (L Leaf blade) of the individuals of the species DACGLO (table 1).

Table 1

The analysis of leaf-blade length variation in DACGLO species

	L Leaf blade (cm)			
DACGLO	Mean	%	dif.	semnif.
VI	21,0	100	ctrl.	
V3	22.3	106	1,35	ns
V6	26,0	124	5,01	

In the table 1, in DACGLO species, could be observed a slight increasing of the leaf blade from 21 cm in the control variant (VI) to 22,3 cm in the variant V3 – fertilized with $N_{60}P_2O_5$ 24 K_2O 60, and in the variant V6 – fertilized with N 240 P_20_5 96 K_2O 240 it could be also observed an increasing of the leaf blade length to 26 cm, which in statistic terms means distinctly significant.

MV– green mass of the leaf blade, in the DACGLO species is presented in the table 2.

Table 2

The analysis of the green mass variation of the leaf blade in DACGLO species

	MV(g)			
DACGLO	Mean	%	dif.	semnif.
VI	0,129	100	ctrl.	
V3	0,131	101	0,002	ns
V6	0,187	145	0,058	**

Analyzing the table 2, in the species DACGLO it could be observed a significant increasing of the green mass from 0,129 g within the variant VI to 0,131 g within the variant V3, which however is non-significant, but it becomes distinct significant in V6 (0,187g). Here arises the idea that massive amounts of NPK lead to increasing of MV indicator in the species DACGLO.

The SU indicator – quantity of dry substance at foliar level has been determined in the species DACGLO and it is presented in table 3.

In the table 3, in the species DACGLO it could be observed a non-significant increasing of the dry substance content of the leaf blade from 0,051 g within the variant VI to 0,053 g within the variant V3 and further non-significant as well.

Table 3

The analysis of the dry mass variation of the leaf blade in DACGLO species

	SU(g)			
DACGLO	Mean	%	dif.	semnif.
VI	0,051	100	ctrl.	
V3	0,053	103	0,001	ns
V6	0,057	112	0,006	ns

TMS is considered to be the best indicator of the specific growth speed (Weiher et al., 1999; Ryser, 1996) and of resource utilization (Peter et al.,1999). The TMS indicator in the species DACGLO has been calculated to be the ratio between SU/MV.

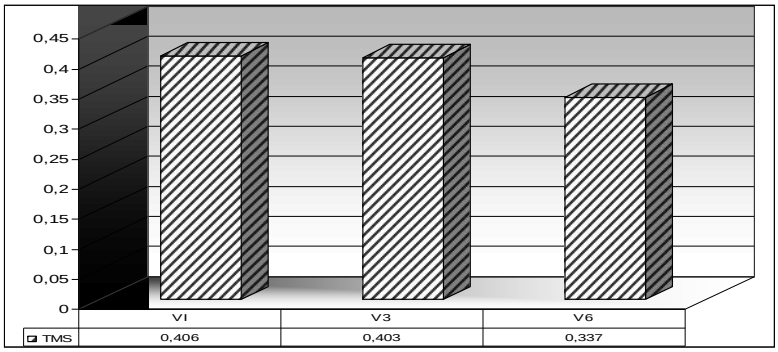

Figure 1. Dynamics of the leaf blade TMS indicator in the species DACGLO within the variants VI, V3 and V6 of the experimental field

In the figure 1, it could be noticed that the TMS values decrease with increasing of the mineral fertilizer amounts. Here appears the conclusion that fertilization leads to bigger and heavier leaves in *Dactylis glomerata*, with a lower content of SU. This makes the plants be consummated with pleasure by animals.

Table 4

The analysis of dry matter content (TMS) variation in DACGLO species

	TMS			
DACGLO	Mean	%	dif.	semnif.
VI	0.406	100	ctrl.	
V3	0.403	99	-0.003	ns
V6	0.337	83	-0.069	

From statistically viewpoint, in the table 4, in the species DACGLO, we found a non-significant decreasing of the TMS indicator from 0,406 within the control variant (VI) to 0,403 within the variant V3 and further a significant decreasing to 0,337 g within the variant V6.

CONCLUSIONS

In conclusion, by progressive applying of the mineral fertilizers, the length of the leaf blade increases from 21 cm in the unfertilized variant to 22,3 cm in the variant V3, the maximal value by 26 cm being achieved in the variant V6 by fertilization with N 240 P_2O_5 96 K_2O 240.

- the maximal value of MV (0,1879) is found in the species DACGLO by applying the maximal amount of fertilizer - in the variant V6;
- by fertilization, the SU indicator at foliar level in the species DACGLO has an non-significant increasing;
- analyzing the TMS indicator it could be observed that this species decreases in a high fertility environment (V6) in the species DACGLO, while the MV indicator increases and SU indicator decreases.

Dactylis glomerata is a species which responds very well to fertilization, adopting a capture strategy, characterized by a lent recycling of the vegetal organs, with precocious phenology and with medium aptitudes for grazing.

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