

INFLUENCE OF N FERTILIZATION APPLICATION AND REGROWTH ON THE YIELDS OF GRASSLAND

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ABSTRACT

The effect of different levels of fertilization and regrowth periods on the quantity and quality and distribution of yields of eleven grassland species were studied in two plots in Hungary.

The effect of the following variables were tested: regrowth period of 20 and 40 days; control, 100 and 200 kg N ha⁻¹ and 11 grass and leguminous species.

KEYWORDS

regrowth period, fertilizer-N, herbage yield, grassland species

The following conclusions can be drawn from the results:

1. The length of regrowth periods had a substantial effect on the quantity, quality and distribution of herbage production. The total herbage yields were found to be lower for the 20 day regrowth period by 13-23% than that of the 40 day regrowth period but the distribution of yields among the cuts was more homogeneous.
2. The two different levels of fertilizer-N application resulted in no significant differences in total herbage yield. Economic figures derived from farming practice support this finding by confirming that the application of 200 kg N ha⁻¹ was not found to be economic in either plot in any of the previous years. The optimal dosage of fertilizer-N is about 100 kg ha⁻¹ in sown sward without irrigation.
3. There are significant differences between the different species with respect to the quantity and quality of yield as well as its distribution among the cuts. The highest forage and dry matter yields were achieved in both years by *Festuca arundinacea*, *Bromus inermis*, *Phalaris arundinacea* and by Legumes *Lotus corniculatus*, *Coronilla varia* and *Trifolium repens*.

INTRODUCTION

In Hungary the 1.2 million ha grassland constitutes as much as one fifth of the total agricultural land area. Because of its low productivity it only meets one third of the total feed requirements of ruminants.

In order to cut down on costs, the yields of grasslands should be increased so that valuable cultivated land areas (alfalfa, maize silage) used so far for forage production could be utilized for crop production. It is therefore of primary interest to find suitable methods to increase herbage yields with the minimum of inputs.

The crucial role of N fertilizers in grassland management has been emphasized by many authors; by Barcsák *et al.* (1978), Barcsák and Tasi (1983), Vrbovski (1976) and Rieder (1975).

The effect of different regrowth periods was first studied by Zürn (1954) emphasizing the positive effect of long regrowth periods (30-40) on grassland productivity. Under the climatic conditions prevailing in Hungary in May 18-20 days, while in the hot summer months 36 days were found to be optimal by Nagy (1968). Studies conducted by Barcsák *et al.* also supported the average of 30 day regrowth period as the optimal one allowing 20, 25 and 30 days after the 1st, 2nd and 3rd cuts, respectively.

Relatively little research went into the differential response of various grasses to regrowth periods of different lengths and varying level of

fertilizer- N.

In Hungary the most relevant data in this respect are to be found in the studies — not comparative ones — conducted by Gruber (1954). Comparative studies were carried out by Janovszky (1981), Nagy (1981) and Kovács and Angeli (1978).

METHODS

The experiment was designed to study the resistance and differential response given to fertilizer N of 11 grass and Legume species most commonly used as bulk feeds in cattle husbandry in their respective monocultures and mixed swards.

The experiments were conducted in two plots: Gödöllő and Boldva. The soil in Gödöllő was sandy brown forest soil with slightly acidic pH and the area is hilly, while in Boldva it was an acidic heavy grassland soil rich in humus. The area is situated in a river valley. The experimental years were dominated by drought.

The following plant species were involved in the investigation:

- | | |
|--------------------------------|------------------------------|
| 1. <i>Trifolium repens</i> | 7. <i>Dactylis glomerata</i> |
| 2. <i>Festuca pratensis</i> | 8. <i>Lotus corniculatus</i> |
| 3. <i>Lolium perenne</i> | 9. <i>Festuca rubra</i> |
| 4. <i>Festuca arundinacea</i> | 10. <i>Coronilla varia</i> |
| 5. <i>Bromus inermis</i> | 11. <i>Poa pratensis</i> |
| 6. <i>Phalaris arundinacea</i> | 12. mixed swards |

The average area per species was 300 m x 21 m. This was divided into three 7 m bands for the three different levels of fertilizer applications:

- control
- 100 kg N ha⁻¹ + 40 kg P₂O₅ ha⁻¹ + 40 kg K₂O ha⁻¹
- 200 kg N ha⁻¹ + 80 kg P₂O₅ ha⁻¹ + 840 kg K₂O ha⁻¹

Each band was divided horizontally into two parts for the two regrowth periods tested:

- 20 days
- 40 days

RESULTS AND DISCUSSION

The effect of regrowth period on herbage yield. The average dry matter yield ha⁻¹ for the 20-day regrowth period exceeded that of the 40-day period by 1.4 t in Boldva and 0.56 t in Gödöllő. The effect of the three different levels of fertilizer-N applications on the dry matter yield ha⁻¹ in the two regrowth periods is summarised in Table 1. It can be concluded that the difference in dry matter ha⁻¹ caused by the different regrowth periods is slightly influenced by the different fertilizer-N applications, the effect, however, is insignificant. The differences between the species were found to be greater than the differences caused by the differential fertilizer-N applications in relation to the length of the regrowth period. *Festuca rubra*, *Poa pratensis*, *Lolium perenne* produced the most pronounced response —the difference in yield was the greatest — to the short and long regrowth periods.

Effects of fertilizer-N. The following yields were recorded as the average of the different regrowth periods and species (t ha⁻¹) in Table 2. Statistically significant differences could only be shown between

the fertilized and not fertilized paddocks but not between the two levels of fertilizer N. The species showed differences in their response to the varying levels of fertilizer N. The only species which produced significantly higher yield as a result of 200 kg N ha⁻¹ fertilizer N was *Festuca arundinacea*. The rest was not worth the higher levels of fertilization.

On the basis of these results it is clear that the specific demands of the species included in the swards is to be taken into consideration when working out the appropriate levels of fertilization and general management.

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Table 1

The effect of the three different levels of fertilizer-N applications on the dry matter yield ha⁻¹ in the two regrow periods

	Gödöllő			Boldva		
	20 d	40 d	extra yield	20 d	40 d	extra yield
0	3.86	5.43	1.57	2.20	2.72	0.52
100 kg N ha ⁻¹	4.96	6.26	1.30	5.10	5.63	0.53
200 kg N ha ⁻¹	5.45	6.78	1.33	5.15	5.77	0.62

Table 2

The effect of different levels of fertilizer-N applications on the total herbage yields as the average of the different regrowth periods and grassland species (t ha⁻¹)

	Gödöllő	Boldva
0	4.65	2.46
100 kg N ha ⁻¹	5.61	5.35
200 kg N ha ⁻¹	6.12	5.18
SzD5%	1.14	0.87

Figure 1
Drymatter yield in average of regenerating time and fertilizing (Boldva)

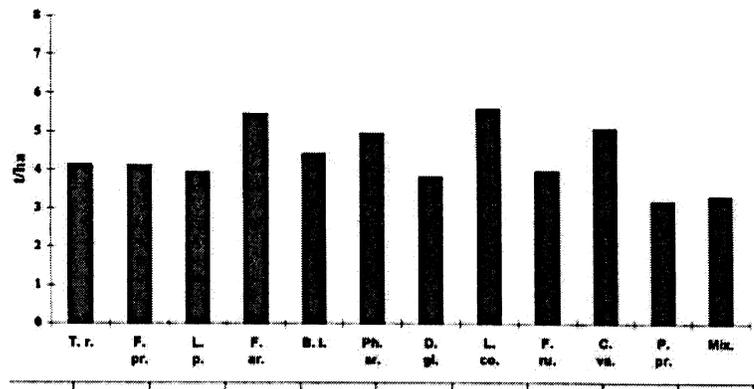


Figure 2
Drymatter yield in average of regenerating time and fertilizing (Gödöllő)

