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Theme 2. Grassland production and utilization
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Impact of the last grazing time on the white clover/grass swards performance

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Introduction

Winter survival and longevity of grasses depend not only on the weather conditions but also on the state of grasses in the autumn, when their wintering shoots and roots are intensively accumulating reserves of nutrients (Stout, 1987; Sardana and Narwal, 2000). The long-term productivity of the sward depends on the species composition of grasses, frequency of use, nitrogen fertilisation, and timing of the last cut. The effects of these various factors on the sward can be very diverse in various geographic locations (Van Keuren, 1988; Taneja *et al.*, 1994; Sollenberger and Newman, 2007). When utilising pastures in the regions of more humid climate, it is very important to finish grazing at the right time so as to allow the sward to accumulate the necessary amount of nutrients and to prevent excessive trampling or poaching of the sward by livestock. Sward trampling results in the reduction in sward productivity and in the occurrence of forbs, moreover, it requires extra costs for the elimination of sward surface defects, especially when combined management (grazing and cutting) of the sward is applied. Consequently, the differences in the optimum time of the last cut are relatively great for different sward types and depend on many factors. The objective of the present study was to determine the time of the last cut in the sowing year and years of use of two pasture swards of *Festulolium* and perennial ryegrass each sown with white clover.

Materials and Methods

Field experiments were conducted on a gleyic light loamy cambisol. Soil pH varied between 6.4-6.8, humus content was 3.2-3.5%, available P 104-112 mg kg^{-1} and K 118-130mg kg^{-1}. Two experiments were set up. Vetch and oats mixture was undersown with two types of grass mixtures. Perennial ryegrass (cv. 'Zvilgė') 15 kg ha^{-1} was mixed with white clover (cv. 'Suduviai') 2 kg ha^{-1}. The other mixture was composed of *Festulolium* (*Lolium multiflorum x Festuca pratensis) cv.*'Punia' 18 kg ha^{-1} and white clover 2 kg ha^{-1}. After harvesting of vetch and oats mixture for forage, the swards in the autumn of the sowing year were cut and in the years of use were grazed. The date of the last utilisation in autumn was varied in two weeks intervals between September 1 and November 1. The swards were used for four years. In the spring of each year of use the swards were fertilised with P_{60} K_{60}. The annual rate of nitrogen fertiliser N_{120} was applied at N_{40} in spring and after the second and third grazing. Plot size was 2.5m ×10.0 m. The treatments were replicated 4 times and were grazed 4-5 times with a herd of dairy cows. Herbage yield was measured by cutting half of the plot before grazing. The botanical composition (grasses, clover, forbs) of the samples was measured after separation and is presented as dry matter weight. For the assessment of forage quality, chemical analyses of dry matter were performed for: crude protein, by determining the amount of nitrogen and multiplying by 6.25, crude fibre by the Hennerberg-Stohmann method, crude fat by the Rushkovski method, crude ash, by combustion. The experimental data were processed by the method of analysis of variance applying the ANOVA procedure.

Results and Discussion

Herbage dry matter annual yields averaged over four years are presented in Table 1. A delay in grazing from September 1 to October 15 resulted in an increase in herbage dry matter yield for both swards. When grazing was performed on November 1, a significant reduction in the herbage yield occurred. Under Lithuania's conditions grass vegetation stops in the third ten-day period of October due to the weather becoming cold, often accompanied by the first snow. Grass leaves turned brown, the swards lodged and this determined the reduction in the herbage yield of the last grazing. The highest annual herbage dry matter yield was obtained in the first year of use. The sward composed of *Festulolium* and white clover tended to yield better. The yield of the swards of the first year of use responded more to the timing of the last grazing compared with the swards of later years. The highest herbage dry matter yield for both swards was obtained when grazing was finished on September 15 and October 15. In the swards of the second year of use the effect of the timing of the last grazing on the herbage yield in *Festulolium* sward was found to be insignificant, and in the sward of perennial ryegrass herbage yield significantly declined when grazing had been finished on October 1 and November 1. When the sward had been grazed on October 1, the herbage re-grew a little and was utilising nutrient reserves for re-growth. Utilisation of nutrient reserves for autumn re-growth of sward often tends to decline the productivity of the sward in the

following year (Stout, 1987). Grasses persist best in the sward and yield best when they are cut relatively early at the beginning of September or late, shortly before the end of the growing season. In the third year of use the sward yield variation relationship remained the same as in the first year of use – the highest yield was obtained having finished grazing on September 15 and October 15. In the fourth year of use completion of grazing from September 15 to November 1 did not result in significant yield differences for both swards. Thus, younger swards respond more to the timing of the last grazing compared with older ones. Averaged data suggest that the highest yields of digestible protein 829 – 837 kg ha^{-1} were obtained when grazing had been finished on September 15 (Table1). Delay in the last grazing resulted in a marked deterioration of herbage nutritive value. When herbage had been cut on October 1, this gave already a significant reduction in crude protein content and an increase in crude fibre. When grazing had been performed on November 1, crude protein content in herbage declined to 181- 185 g kg^{-1} DM. Significant reductions occurred in herbage crude ash, P, K, Ca contents, while the content of crude fat remained similar. After four years of use a higher percentage of perennial ryegrass thinned out. In the fourth year of use *Festulolium* accounted for 65.8 – 72.8 % of the dry matter yield, perennial ryegrass accounted for 57.6 – 61.4 %. White clover accounted for 13.9 – 16.4 % of dry matter yield in *Festulolium* sward, and in ryegrass sward white clover accounted for 9.8 – 14.1 %. A higher percentage of forbs was found in ryegrass sward.

Table 1: Annual dry matter yield, proportion sown grasses and chemical composition of dry matter yield of the last grazing (average of four years of sward use from two trials).

Date of the last grazing	**Annual yield t DM ha^{-1}**	**Proportion of sown grass %**	**Proportion of white clover %**	**Crude protein g kg^{-1}**	**Digestible protein kg ha^{-1}**	**Crude fibre g kg^{-1}**	**Crude ash g kg^{-1}**
Festulolium + white clover							
1 September	6.05	69.6	12.2	212	759	238	87
15 September	6.54	72.8	10.1	205	837	249	83
1 October	6.06	69.2	14.1	193	766	255	86
15 October	6.50	71.0	10.5	192	768	266	75
1 November	6.10	65.8	9.8	181	757	259	64
Perennial ryegrass + white clover							
1 September	5.51	61.0	15.9	221	756	238	85
15 September	5.84	61.4	16.4	216	829	236	87
1 October	5.42	58.6	15.7	203	724	249	80
15 October	5.99	57.6	16.4	198	766	254	77
1 November	5.38	58.0	13.9	185	706	265	70
$LSD_{0.05}$	0.27	9.0	5.1	10.3	32.7	16.7	8.1

Conclusion

In pastures dominated by perennial ryegrass and *Festulolium* with white clover it is not advisable to perform the last grazing at the end of September –beginning of October. For such swards it is better to finish grazing at the end of grass growing season in the middle of October. Younger swards (of the sowing year and first year of use) are more sensitive to the timing of the last grazing compared with older swards.

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