

APPLICATIONS OF HEIGHT-BASED GRAZING MANAGEMENT IN MIXED SWARDS

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ABSTRACT

Grazing efficiency and livestock performance were compared on swards rotationally grazed down to either 50 or 100 mm for three years. With a fixed entry height of 200-250 mm, standing swards of mixed grasses and white clover (*Trifolium repens* L.) were stratified into 50 mm vertical layers both pre- and post-grazing. Through four or five cycles of grazing each year for three years, a fixed entry height range stabilized total standing herbage at 3250 to 3690 kg OM ha⁻¹. Organic matter on-offer above 100 mm was 36, 45, and 43% of total standing herbage in the three years, compared with 60, 66, and 62% above 50 mm. Lowering residual height from 100 to 50 mm increased percentage disappearance of total standing herbage from 44, 44, and 48% at 100 mm to 60, 61, and 62% at the 50 mm residual. Grazing to the lower residual increased utilization efficiency by about 35%, but did so at the expense of individual animal intake. Daily OM intake was 2.8, 2.7, and 2.9% of bodyweight in the 100 mm residual, but declined to 2.2, 1.9, and 2.1% when stock were obliged to graze down to a 50 mm residual. The homogeneity of IVOMD above 50 mm suggests that reduced rate of intake in the 50-100 mm layer resulted from factors other than quality, such as difficulty of prehension or avoidance of soiled herbage.

KEYWORDS

Intake, IVOMD, Residual Grazing Height, Rotational Grazing, Sward Height

ABBREVIATIONS

In Vitro Organic Matter Digestibility (IVOMD), Organic Matter (OM)

INTRODUCTION

Recommended grazing management protocols for the humid temperate zone tend to have been developed on perennial ryegrass (*Lolium perenne* L.) based swards. Graziers attempting to manage a range of coarser grass species adapted to the greater climatic extremes of continental North America would benefit from management recommendations tailored to their conditions.

The use of sward height to manage growth and utilization has been well documented, particularly in continuously stocked pastures (Baker et al. 1981; Maxwell et al. 1994). As part of a larger program, the current paper reports on the effects of varying residual grazing height on total standing herbage per rotation, on herbage on-offer and utilization efficiency, and on rate of OM intake by grazing beef cattle.

METHODS

The ability of sward height-based management to stabilize herbage on-offer, simplify sward management, and sustain intake and gain, was assessed in a three year study at the Elora Research Station (43° N) in Ontario, CANADA. In 1989, a field was subdivided into 16, 0.1 ha paddocks, of which half were sown to each of orchardgrass (*Dactylis glomerata* L.), bromegrass (*Bromus inermis* L.), perennial ryegrass and white clover or tall fescue (*Festuca arundinacea* Schreb.), Kentucky bluegrass (*Poa pratensis* L.), perennial ryegrass,

and white clover. Each mixture supported four replicates of two residual grazing heights - 50 and 100 mm - with the whole arrayed in a randomized complete-block design.

Starting in 1990, paddocks were grazed rotationally by beef cattle, varying stocking rate and grazing duration as needed to achieve the pre-set entry (200-250 mm) and exit (50 or 100 mm) heights. Pre- and post-grazing canopy heights were measured with 50 readings per paddock, using a modified HFRO sward stick. Pre- and post-grazing herbage was sampled with 6, 1500 cm² quadrats per paddock, using electric sheep shears with a vacuum attachment and a specially equipped quadrat to support harvest in 50 mm strata starting from the ground upwards. Each layer was analyzed for organic matter (OM) yield and in vitro organic matter digestibility (IVOMD).

RESULTS AND DISCUSSION

Total standing herbage at entry ranged from 3250 to 3690 kg OM ha⁻¹ over the three years (Table 1), with no effect of residual grazing height and remarkably little effect of year, although the three years differed substantially in both temperature and rainfall (data not shown). The proportion of standing herbage that was "on-offer" above the target residual height, as well as the percentage disappearance of standing herbage were also relatively stable among years (Table 1). However, lowering residual grazing height from 100 to 50 mm increased herbage on-offer by 52% (from 36, 45, and 43% to 60, 66, and 62% of standing herbage, over the three years, respectively), and further, increased herbage disappearance by 35% (44, 44, and 48% vs. 60, 61, and 62%, over the three years, respectively). With an entry height of 200-250 mm, the 50-100 mm layer accounted for about 20% of the standing herbage, but 40% of herbage on-offer above 50 mm (data not shown). Thus, including the 50-100 mm stratum within the grazed horizon substantially increased herbage on-offer, and potentially, carrying capacity.

However, obliging stock to graze down to 50 instead of 100 mm reduced intake rate from 2.8, 2.7, and 2.9% to 2.2, 1.9, and 2.1% (OM as % of liveweight day⁻¹; Table 1). Because IVOMD of herbage in the 50-100 mm layer did not differ from that in the upper layers, it appears unlikely that digestibility could have been a factor in the reduced rate of intake. Although not measured, it is possible that time spent in avoiding soiled patches, or difficulties in prehension, could have reduced intake. The 26% reduction in rate of intake when residual height was dropped to 50 mm was all the more noteworthy because it was recorded over 2-4 day grazing intervals, suggesting that intake on the final day of a given interval would have been lower still.

CONCLUSIONS

Fixed entry and exit heights proved to be a practical tool in stabilizing a) standing herbage, b) herbage on-offer, and c) herbage disappearance, even over years differing substantially in temperature and moisture patterns. Sward height-based management may be an effective and workable tool to manage pasture swards in the humid temperate zone of North America.

In swards entered at 20-25 cm, grazing down to 10 cm utilized only about 40% of standing herbage, but promoted rapid rates of intake, and the potential for high individual animal performance. Conversely, obliging grazing down to 5 cm increased utilization (disappearance) by 35%, but reduced rate of individual animal intake by 26%. Decisions on target residual grazing height will need to reflect the specific requirements of individual producers.

REFERENCES

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Table 1									
Total standing herbage, organic matter on-offer, organic matter disappearance, and herbage intake in response to residual grazing height, expressed as means over grazing cycles, for 1990 - 1992 at Elora, Ontario, Canada.									
Residual Height	1990			1991			1992		
	100 mm	sig†	50 mm	100 mm	sig†	50 mm	100 mm	sig†	50 mm
Total Standing Herbage (kg OM ha ⁻¹)	3690	0.08	3550	3610	ns	3630	3250	ns	3280
Organic Matter on-offer (%)	36	***	60	45	***	66	43	***	62
Organic Matter Disappearance (%)	44	***	60	44	***	61	48	***	62
Herbage Intake (% liveweight d ⁻¹)	2.8	***	2.2	2.7	**	1.9	2.9	**	2.1
†*, **, ***, significant at the 0.05, 0.01, and 0.001 levels, respectively; ns, nonsignificant									