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Vertical distribution of plant parts and the selectivity of harvesting heights by cattle in *Miscanthus sinensis*

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Key words: availability, cattle, foraging heights, *Miscanthus sinensis*, vertical distribution

Introduction The previous study showed that survival and regrowth of *Miscanthus sinensis* tillers were sensitive to defoliation of shoot apex and the trampling by grazing cattle (Takahashi *et al.*, 2008). It is generally recognized that grazing herbivores select plant species and plant parts to maximize their intake rate (Gross *et al.*, 1993). However, there is little information on foraging response of herbivores to sward structure in the long grass, *M. sinensis*. The aim of this study is to understand the relationships between harvesting height of cattle and vertical distribution of plant parts in a *Miscanthus sinensis* grassland.

Materials and methods The study was conducted on June-July (summer) and September (autumn) in 2003, at a *Miscanthus* grassland (1.2 ha) in Kawatabi Field Science Center, Graduate School of Agricultural Science, Tohoku University. In the two seasons, eight steers were grazed in the grassland for 5-7 days at 29.7-37.8 animal unit (AU) · days/ha. Before grazing in each season, leaf density was estimated as frequency of occurrence measured for every layer at a 20 cm height interval from the ground in the canopy of *M. sinensis*, within 9 plots (50 cm × 50 cm each). Standing crop (the mass of leaves and stems) was also measured by cutting within the plots. During each grazing period, the number of bites taken by steers was counted (3-14 hours, 3 days) by visual observation, and proportion of the bites in individual layers to the total bites was calculated.

Results and discussion Leaf mass was high in layers of 20-80 cm in summer (42-78 g DM/m²), and nearly equal in individual layers of 0-80 cm in autumn (33-51 g DM/m²) (Figure 1). Vertical distribution of leaf density was similar to that of leaf mass. Proportion of bites taken by steers was highest in layer of 20-80 cm (in which, leaf density was more than 84%) in both seasons. Leaf mass in individual layers was significantly related to leaf density of the layers (Figure 2; $P < 0.001$), meaning that leaf density well revealed vertical distribution of leaf mass in *M. sinensis*. Proportion of bites taken by steers increased curvilinearly with increasing leaf density in individual layers (Figure 3; $P < 0.001$). The result indicates that cattle strongly take bites from layers having more available leaf mass.

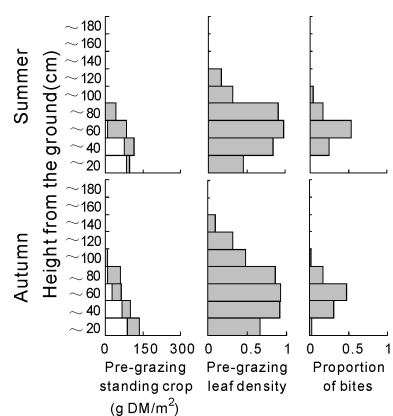


Figure 1 Vertical distribution of leaf and stem in *M. sinensis* and proportion of bites taken by grazing steers.

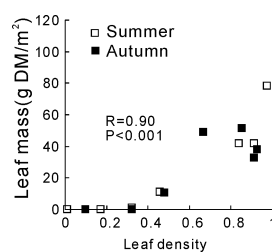


Figure 2 The relationship of leaf mass to leaf density in the *M. sinensis* grassland.

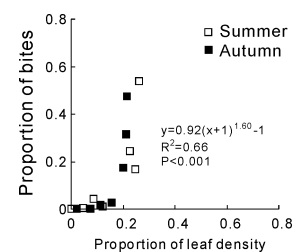


Figure 3 The relationship of proportion of bites taken by grazing steers to proportion of leaf density in the *M. sinensis* grassland.

Conclusions Grazing cattle selected the layers with high leaf mass in both seasons. This selectivity in harvesting heights probably gives severe impacts on *M. sinensis* (Takahashi *et al.*, 2008), which cause deterioration of *Miscanthus* grasslands.

References

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