Effects of Herbage Species on the Spatial Heterogeneity of Biomass in Grazed Pasture: Kentucky Bluegrass vs. White Clover

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Key words : calf , grazing pressure , *Poa pratensis* , rising plate meter , *Trifolium repens*

Introduction Recently , the spatial heterogeneity of plant biomass in grassland has been investigated from various approaches . However , those previous studies did not address the following aspect : if different plant species are grown in grassland , will the dynamics of spatial heterogeneity of the biomass differ ?" . This problem is important in evaluating the universality of the results of previous researches concerning the spatial heterogeneity of plant biomass . We investigated whether the different herbage species , for example Kentucky bluegrass (*Poa pratensis* L . , KB) and white clover (*Trifolium repens* L . , WC) , influence the spatial heterogeneity of the biomass in grazed pasture .

Materials and methods Three pastures (each 10 a in area) were established as follows : the first consisted of 30% KB-dominated pasture and 70% WC-dominated pasture , the second consisted of 50% KB and 50% WC , and the third contained 70 % KB and 30% WC by ground area . The grazing experiments were carried out in 7 successive days for periods I (from 8th to 15th May) , II (from 29th May to 5th June) and III (from 19th to 26th June) in 2006 . Three groups of two Holstein castrated calves (mean age 186±55 days and mean liveweight 154 .2±30 .7 kg) were the subjects for the study .Aboveground biomass was measured at 50 points in each area (KB or WC dominated) of the three pastures with a Filip's Folding Sward Meter (Jenquip , New Zealand) every morning (grazing period and the next day) . Behavioural observations were carried out in each test period (Fukasawa et al . , 2007) . The observers recorded which calf ate KB or WC during the morning meal and the evening meal on each observation day . In the results of the behavioural observations , the selectivity for each species area of the calf groups during each experiment period was stable . Therefore , we considered the following unit as grazing pressure : head · min · 8 h^{-1} · a^{-1} (liveweight 500 kg = 1 head) . The spatial heterogeneity of biomass was evaluated using SD (standard deviation) and CV (coefficient of variation) of the biomass (g DM 0 .25 m^{-2}) . We applied GLM (general linear model) to the SD and CV using the herbage species , average biomass , grazing pressure , paddocks , and experimental periods as autonomous variables .

Results and discussion Though the effects of herbage species on SD and CV were not significant , the effects of the interactions between herbage species , and paddocks and experimental periods were significant (GLM , $P<0.05$) . In both KB and WC areas , positive correlations were found between the average and the SD of biomass , between the CV of biomass and grazing pressure , and no significant correlations between the SD and grazing pressure (Table 1) . No significant correlations were found between the average and the CV in KB areas , while negative correlations were found in the WC areas . The results suggest that the spatial heterogeneity dynamics were apparently different between the KB and WC areas even in such a short term .

Table1 *Correlation matrix between average , SD and CV of biomass (g DM 0 .25 m^{-2}) , and grazing pressure (head · min · 8 h^{-1} · a^{-1}) on each of KB and WC areas .*

	KB			WC		
	Average	SD	CV	Average	SD	CV
SD	0 .82***			0 .52***		
CV	-0 .06	0 .51***		-0 .59***	0 .35**	
Grazing pressure	-0 .46***	-0 .18	0 .41***	-0 .52***	0 .07	0 .64***

** $P<0.01$,*** $P<0.001$.

Conclusion We should understand that the dynamics of the spatial heterogeneity of grasslands can be modified by the differences of herbage species .

Reference

Fukasawa , M . , Tachi , N . , Tsutsumi , M . , Kosako , T . , Tsukada , H . , (2007) . The effect of area proportion of Kentucky bluegrass and white clover swards on diet selection of calf . *Japanese Journal of Grassland Science* , 53(Ext .) , 280—281 (in Japanese only) .