Evaluation of Kentucky Bluegrass (*Poa pratensis* L.) for Creating Sustainable Grazing Swards in Hokkaido

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EVALUATION OF KENTUCKY BLUEGRASS (POA PRATENSIS L.) FOR CREATING SUSTAINABLE GRAZING SWARDS IN HOKKAIDO

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Abstract

Kentucky bluegrass (*Poa pratensis* L.) is generally considered to be a weed in the meadows of Hokkaido. However, a revaluation of this species should be undertaken in terms of its useful characteristics for labor-saving management on farms in marginal areas. The performance of steers (Holstein-Friesian) and botanical composition of Kentucky bluegrass swards were investigated under the stocking methods of set and rotational grazing and compared with timothy (*Phleum pratense* L.) swards. Kentucky bluegrass was stable over the grazing season under both methods, although timothy decreased rapidly. The average daily gain of steers raised on Kentucky bluegrass swards was lower than that on timothy swards. In Kentucky bluegrass swards, however, a well-regulated number of steers under set grazing can maintain as high an animal performance rate as that under rotational grazing. Kentucky bluegrass was considered to be useful for beef production under labor-saving grazing management.

Keywords: Animal performance, botanical composition, labor-saving, *Poa pratensis*, *Phleum*

pratense, rotational grazing, set stocking, sustainable agriculture

Introduction

Even in Hokkaido which has the largest agricultural land area of any prefecture in Japan, the amount of unused farmland has been increasing because of the financial difficulties faced by farm households due to import liberalization of agricultural products. The aging of farmers and decreasing of their successors have accelerated the abandonment of cultivated areas. Lack of labor has led to the collapse of rural society – this is now one of the major social problems in Japan. Therefore, the development of agricultural skills for sustainable farming is needed to minimize the abandonment of cultivated land. Sustainable farming requires not maximum but stable productivity under labor-saving management in this type of situation. The promotion of beef production is needed in rural area of Hokkaido, because the use of land for grazing is one of the most effective methods of land use.

Due to the low quality and productivity, Kentucky bluegrass (*Poa pratensis* L.; KB) has been considered to be a weed in meadows in Hokkaido (Matsunaka *et al*. 1984), where animal performance has improved year after year. Some methods to control KB have been researched, but it has not completely been controlled yet. This indicates that KB is ecologically stable in Hokkaido. Thus it is expected that KB will be the main grass species for the labor-saving grazing swards.

Animal performance and botanical composition in KB pasture were compared with those in timothy (*Phleum pratense* L.; TY) one, which is generally used to high animal performance, both were evaluated under continuous and rotational grazing.

Material and Methods

Two KB (cv. Troy) pastures and two TY (cv. Hokushu) pastures were established in

1996 and in 1997, respectively. Each of them has an area of 0.625 ha. White clover (cv. Sonia; WC) was mixed in each sward. One of the KB pastures was divided into 10 paddocks for the rotational grazing plots, and another was not divided. The same treatments were set up in the TY pastures. Holstein-Friesian steers (6 months old, 200 kg body weight) grazed each plot from the beginning of May to the middle of October in 1998 and 1999. Each paddock was grazed for 1 day in the rotational grazing plots. The number of steers in each plot was regulated from 6 head to 2-3 head according to the changes in herbage mass. The stocking rate decreased after a stagnation of daily gain due to a lack of herbage mass in 1998, and before stagnation in 1999. The steers were usually weighted every 2 weeks, and every week before and after the stocking rate was adjusted. Herbage mass was predicted daily in rotational grazing plots and weeky in set grazing plots from a metal plate meter. The relationship between herbage mass and plate height was calculated every month, and calibrations were made for each type of grass throughout the grazing season. The herbage growth rate in rotational grazing plots was derived from the difference of herbage mass before grazing and that after grazing. The herbage mass which accumulated in a cage for 2 weeks after cutting, at 3 cm height in KB pastures and 4 cm height in TY pastures, was measured to estimate the herbage growth rate in set grazing plots. Herbage intake was derived as the difference in herbage mass before and after grazing every day in rotational grazing plots, and every week in set grazing plots, which was corrected by herbage growth rate.

Results and Discussion

Characteristics of KB compared with TY in 1998

The dry matter of KB in whole herbage was maintained at 50 % in both plots throughout the grazing season. On the contrary, TY was rapidly dominated by WC. This caused an occurrence of pasture bloat in the steers on the rotational grazing plot in August,

and in the steers on the set grazing plot in October in 1998. KB was more stable for grazing use than TY. TY is already known to be weak at a high cutting frequency (Tejima *et al*. 1997).

Table 1 shows animal performance on each plot. The number of steers on KB plots was much higher than that on TY plots, due to decreases in the herbage mass of TY. On the other hand, live weight gain was the lowest in the KB set grazing, over the grazing season. Ikeda *et al*. (1999) showed 614-721 kg/ha of cumulative live weight gain for Aberdeen Angus steers on TY swards under rotational grazing. Improvement in the methods of regulating steer numbers and grazing intervals in TY pastures might keep TY dominant and increase performance of Holstein-Friesian steers. Thus, KB appears to be a promising grass species for labor-saving grazing swards, but it has a lower animal performance compared with TY.

Improvement of live weight gain in KB set grazing plots in 1998-1999

Because set stocking is suitable for labor-saving grazing management, the improvement of live weight gain under set stocking was tried by regulating the number of steers. Figure 1 shows the seasonal changes in herbage mass, herbage intake and the number of steers in the KB plots. Adequate herbage intake was maintained using rotational grazing in both years. Because there was no regulation of stocking rate until the stagnation of live weight gain, the herbage mass reduced in the set grazing plot, in June of 1998. It decreased herbage intake to 1 kg/100kgBW/day. Moreover, herbage intake did not improve very quickly after regulation of the steer number. On the contrary, early regulation maintained adequate herbage intake over the entire grazing season in 1999. As a result, live weight gain in a set grazing plot was improved up to the level of the rotational grazing plot as shown in Table 1. However, it is difficult to determine the reason for this improvement due to the differences in weather between the years. It suggested the need of investigating the effect of

regulating the number of steers on live weight gain under set grazing, in the same year.

The results of this study showed that KB had the following characteristics suitable for labor-saving grazing management: 1) Animal performance under set grazing can be as high as that under rotational grazing, 2) KB was stable under any grazing methods. 3) Thus, KB was suitable for set grazing.

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Table 1 - Performance of steers under each grazing method on KB and TY sward

Year	Sward	Grazing method	Grazing period			Total number of steers		Live weight gain	
			Start	End	Days	Actual head¥days/ha (A)	On a basis of 500kg BW head¥days/ha	Cumulative kg/ha (B)	Average kg/head¥day (B/A)
1998	TY	Set stocking	5/6	10/13	160	952	491	735	0.77
		Rotaional grazing	5/6	8/9	95	720	357	689	0.96
	KB	Set stocking	4/30	10/15	168	1018	527	555	0.55
		Rotaional grazing	4/30	10/15	168	1070	561	803	0.75
1999	KB	Set stocking	5/6	10/18	165	920	526	929	1.01
		Rotaional grazing	5/6	10/18	165	917	517	818	0.89

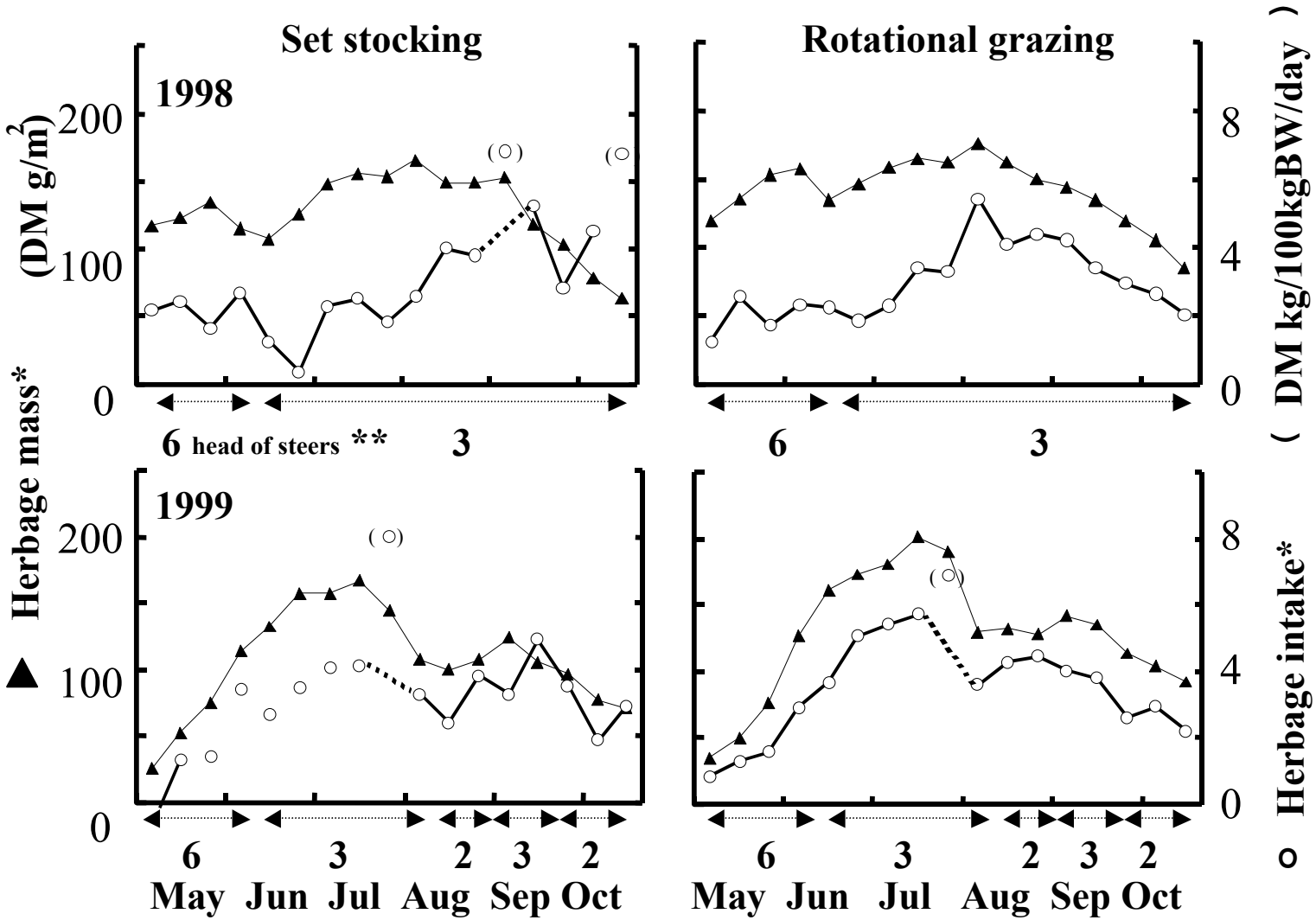

Figure 1 - Change of herbage mass, herbage intake under different stocking rate on KB sward

*, averages in every 10 days; **, head number for a sward (0.625ha) ;

(?) were rejected as extraordinary data