Management of Meadow Fescue Pasture for High-Producing Dairy Cows in Northern Japan

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Abstract

The objective of this study was to establish an intensive grazing system of meadow fescue (*Festuca elatior* L.) pasture for high-producing dairy cows in some areas of Japan where soil freezes in winter. Plant succession of meadow fescue pastures that had been grazed at different plant heights and milk production from cows grazed on meadow fescue pasture compared to that from cows grazed on perennial ryegrass pasture were surveyed over a five-year period. Succession of meadow fescue pasture depended on the management of plant height before grazing use. Milk production from cows grazed on meadow fescue pasture was almost the same as that from cows grazed on perennial ryegrass (*Lolium perene* L.) pasture, and about 50% of the total digestible nutrients demand of milking cows could be supplied from grazing during the grazing season.

Keywords: meadow fescue, perennial ryegrass, succession, grazing, cow, milk production, blood constituent

Introduction

Interest has been shown in meadow fescue (*Festuca elatior* L.) as a possible grass species for high-producing dairy cows grazing in areas of northern Japan where perennial ryegrass (*Lolium perene* L.) cannot survive the winter. Some basic characteristics of meadow fescue pasture under intensive management have been reported (Sudo et al., 1997). This study was conducted to determine the persistency and milk productivity on meadow fescue pasture compared to those of perennial ryegrass pasture and to establish an intensive grazing system of meadow fescue.

Material and Methods

During a five-year period (1995-1999), small plots (each plot being 60 m^2) of meadow fescue and perennial ryegrass swards were grazed for about an hour by four heifers when plant height reached 20 cm, which is the height recommended for perennial ryegrass pasture (Ishida et al., 1995), or 25-30 cm. Plant height and herbage mass were measured before and after grazing. Frequencies of species in each plot were surveyed by the line intercept method in autumn to assess plant succession.

From May to October in each year of the five-year period, a 1.6-ha meadow fescue pasture and a 1.6-ha perennial ryegrass pasture were each divided into 23 paddocks. Four spring-calving Holstein cows grazed on each type of pasture by the one-day grazing system in the daytime, and they were rounded up and set-stocked in a 0.8-ha pasture at night. When

pasture production was high, 8-15 paddocks were preserved and cut in June or July to prevent spindly growth. Cows were fed a supplement twice daily at milking. Their body weights and milk constituents were measured weekly, and blood samples were taken every two weeks to check blood glucose (Glu) and blood urea nitrogen (BUN) concentrations. The amount of supplement given to each cow was reexamined weekly according to the Japanese feeding standard for dairy cattle (MAFF, 1994) considering the conditions of the pasture and the cow. Total digestible nutrients (TDN) supplies from grazing and herbage were back-calculated using the feeding standard and the records of supplement intake. TDN of herbage were estimated (Heany and Pigden, 1963) from dry matter digestibility (Tilley and Terry, 1963).

Results and Discussion

Table 1 shows the results of a small plot grazing test. A short plant height before grazing resulted in a short plant height after grazing. The frequency of meadow fescue decreased and that of invading plants such as Kentucky blue grass (*Poa pratensis* L.) increased in the plot in which the cows were grazed when the plant height reached 20 cm but not in the plot in which the cows were grazed when plant height reached 25-30 cm or in the perennial ryegrass plot.

Milk production from cows grazed on meadow fescue pasture was almost the same as that from cows grazed on perennial ryegrass pasture. Table 2 shows the average amounts of milk production during the five grazing seasons. Daily FCM (fat-corrected (4.0%) milk yield) was about 32 kg / head, estimated milk production from pasture was about 7,000 kg/ha, and about half the amount of TDN demand of the cows was supplied by grazing, 10% by conserved herbage and 40% by concentrate. When the levels of FCM were 40, 30 and 20 kg/day, the proportions of TDN supply from grazing were 46, 53 and 60 %, respectively.

The frequency of Glu concentration of less than 55 mg/dl was 6% for both types of

pasture grazing; thus, according to the standard concentrations of blood constituents in cows (Kida, 1996), there were few problems concerning the energy supply for the cows in this grazing trial. The frequencies of BUN concentration of more than 21 mg/dl were 15% and 12% in cows grazed on meadow fescue and perennial ryegrass pastures, respectively, indicating the need to reduce the crude protein content of concentrate.

It was concluded that milk productivity of meadow fescue pasture is almost the same as that of perennial ryegrass pasture but that the persistency of meadow fescue under the condition of intensive grazing is weaker than that of perennial ryegrass. Therefore, when making a plan for grazing cows on meadow fescue pasture, it is necessary to establish a sufficiently large number of paddocks to assure higher plant height and to reduce the area of a paddock due to great herbage mass (Table 1). Further investigations are needed to determine the effect of stocking intensity on survival of meadow fescue, because, when plant height before grazing was kept at 20 cm, its nutritive value was clearly improved (K. Sudo et al.,1997).

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Table 1 - Averages of plant height and herbage mass and frequency changes in Mf and Pr swards in a small-plot grazing trial conducted over a five- year period

	Actual plant height (cm)		Herbage mass (g/m^2)		Frequency change			
Plot	Before	After grazing	Before	After grazing	Species	Year		
						1st	3rd	5th
Mf	21.2	7.3	141.2	33.9	Mf	97.5	93.8	70.4
20cm	(2.3)	(2.4)	(44.5)	(18.5)	Kb	0.0	0.0	37.0
Mf	27.8	10.4	214.7	62.4	Mf	100.0	100.0	91.9
25-30cm	(3.5)	(4.6)	(54.2)	(27.5)	Kb	0.0	0.0	2.3
Pr	20.2	7.2	110.5	43.3	Pr	96.3	92.5	94.1
20cm	(1.7)	(1.5)	(28.5)	(12.4)	Kb	0.0	0.0	0.0

(s.d.)

Mf, meadow fescue; Pr, perennial ryegrass; Kb, Kentucky bluegrass (which invaded some plots)

Table 2- Milk production and proportions of TDN supply from grazing and herbage (grazing + conserved herbage), expressed by averages during five grazing seasons

Grazing pasture	Meadow fescue	Perennial ryegrass
Fat-corrected (4.0%) milk yield (kg/head/day)	32.5	31.6
Milk production from pasture (kg/ha)	7155	7336
Proportion of TDN supply from grazing (%)	51.1	53.1
Proportion of TDN supply from forage (%)	61.8	63.3