Seasonal Changes in Nutrient Intake of Grazing Beef Cows on an Alpine Pasture in Japan

Masato Yayota
Gifu University, Japan

M. Nakano
Gifu University, Japan

R. Tamai
Gifu University, Japan

Shigeru Ohtani
Gifu University, Japan

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Seasonal changes in nutrient intake of grazing beef cows on an alpine pasture in Japan

M . Yayota[1] ,M . Nakano[2] ,R . Tamai[1] and S . Ohtani[1]
[1] Faculty of Applied Biological Sciences ,Gifu University ,1-1 Yanagido ,Gifu 501-1193 ,Japan .
E-mail : yayo@ gifu-u .ac .jp
[2] The United Graduate School of Agricultural Science ,Gifu University ,1-1 ,Yanagido ,Gifu 501-1193 ,Japan .

Key words : alpine woodland pasture ,forage intake ,grazing cattle

Introduction Alpine woodland pastures or agro-forests in Japan have served as a basis for beef cattle grazing . In these areas , grazing should be established as an extensive system using native forage species . However ,data regarding diet composition , intake ,and digestibility by grazing cattle under these systems are extremely limited . Information concerning seasonal changes in forage quality ,when coupled with estimates of intake and digestibility ,will provide a foundation for nutritional management of grazing cattle .

Materials and methods This experiment was conducted in 2006 at the alpine woodland pasture (121 ha) ,located in central Japan (36°9′ N ,137°6′ E ; altitude ,1500 m) . Approximately 80% of the pasture was woodland and the remainder was native grassland . The pasture was dominated by dwarf bamboo (*Sasa senanensis*) ,with other grasses (e .g . ,*Zoysia japonica*) ,forbs and shrubs as minor components ,and was continuously grazed by a total of 11 cows from 8 June to 9 October 2006 . Three to five Japanese Black cows (mean body weight : 467 kg) were used in this experiment . Three experimental periods of 5 days each were set during the grazing season : 1-6 July (Early) ,25-30 August (Mid) ,and 4-9 October (Late) . Forage intake by the grazing cows was estimated from fecal output and apparent digestibility : fecal output (kg DM day^{-1})/(1 -digestibility) . Fecal output was estimated by the single-pulse dose method using a ytterbium (Nakano et al . ,2008a) ,and apparent digestibility was estimated by acid detergent insoluble ash in forage and feces (Van Soest et al . ,1991) . On days 1 ,3 ,and 5 in each experimental period ,two cows were closely observed for 1 h during the morning and afternoon meal ,and forage samples were collected to simulate diet selection by the cattle .

Results Crude protein (CP) ,rumen-degradable protein (RDP) and-undegradable protein (RUP) ,neutral detergent fiber (NDF) , and acid detergent fiber (ADF) of the grazed forage were almost stable through the grazing season ,while acid detergent insoluble protein (ADIP) and acid detergent lignin (ADL) increased during late-grazing season ,compared with early-and mid-grazing seasons (Table 1) . Intake and apparent digestibility of dry matter (DM) ,CP ,and NDF were significantly lower in mid-and late-grazing season than in early-grazing season ($P < 0.05$) (Table 2) . Metabolizable energy (ME) intake in mid-and late-grazing seasons was also lower than that in early-grazing season ,and did not satisfy the requirement of the cows .

Table 1 *Chemical composition of the grazed forage by the cows .*

	Early	Mid	Late
DM (g/kg)	276 .2	271 .6	297 .5
	g/kg DM		
CP	137 .9	131 .4	131 .3
RDP	57 .9	54 .8	52 .3
RUP	80 .0	76 .6	79 .0
ADIP	10 .2	11 .7	14 .1
NDF	668 .2	630 .3	626 .4
ADF	346 .7	332 .2	339 .7
ADL	61 .0	59 .6	79 .7

Table 2 *Intake and apparent digestibility of the grazing cows .*

	Early	Mid	Late
DM intake (g/kg BW)	20 .8[a]	10 .5[b]	12 .0[b]
CP (g/kg BW)	2 .9[a]	1 .4[b]	1 .6[b]
NDF (g/kg BW)	13 .9[a]	6 .6[b]	7 .5[b]
DM digestibility	0 .65[a]	0 .48[b]	0 .45[b]
CP digestibility	0 .63[a]	0 .48[b]	0 .48[b]
NDF digestibility	0 .68[a]	0 .49[b]	0 .46[b]
ME intake (kcal/kg MBW)	**224 .4[a]**	**80 .9[b]**	**90 .1[b]**
ME intake/ME requirement	1 .3	0 .4	0 .5

BW : Body weight , MBW : Metabolic body weight

Conclusions Forage intake and apparent digestibility were obviously decreased in mid-and late-grazing seasons . One factor was the increase of indigestible fraction such as ADL ,while another factor would relate to the spatial grazing pattern by the cows (Nakano et al . ,2008b) . Thus ,the cows were unable to satisfy their energy requirements during mid to late grazing season ,even though the pasture had sufficient forage mass .

References

Nakano ,M . ,Yayota ,M . ,Ohtani ,S . ,2008 . Evaluation of the single pulse dose method for estimating herbage intake by cattle in a large scale free-ranging system . *Grassland Science ,in press* .

Nakano ,M . ,Yayota ,M . ,Tamai ,R . ,Ohtani ,S . ,2008b . Spatial distribution of forage intake by beef cows grazed on an alpine pasture in Japan .*Proceedings of XXI th International Grassland congress* ,in press .

Van Soest ,P .J . ,Robertson ,J .B . ,Lewis ,B .A . ,1991 . Methods for dietary fiber ,neutral detergent fiber ,and nonstarch polysaccharides in relation to animal nutrition . *J Dairy Sci* 74 : 3583-3597 .