

FORAGE PRODUCTIVITY AND ANIMAL PERFORMANCE ON DIFFERENT GRASS/LEGUME PASTURES FOR GRAZING MANAGEMENT

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ABSTRACT

A grazing trial was carried out to determine the effects of different grass/legume pastures on forage productivity, nutritive value, and animal performance. The pasture mixtures were mainly orchardgrass (OG)+ladino clover(T1), mainly OG+alfalfa(T2), mainly perennial ryegrass+alfalfa(T3), and grasses alone (mainly OG, T4). The pastures were rotationally grazed 7 times with growing heifers in 1991 and 1992.

The proportion rate of ladino clover in T1 mixtures rapidly increased from 21% up 54 to 68% during the grazing season. However, the rate of alfalfa in T2 and T3 ranged between 12% and 23%. The annual dry matter yield ranged from 9.19 in T4 to 9.61MT/ha in T3. The contents of crude protein and calcium of forages were highest in T1(23.2%, 0.68%), lowest in T4(18.5%, 0.13%) The liveweight gain per ha was greatest in T1(1,073kg), lower in T2(810kg) and T3(784kg), and lowest in T4(643kg). In conclusion, pasture mixtures which included legume(clover) can increase forage nutritive value and animal performance.

KEYWORDS

Grazing, animal performance, nutritive value, legume

INTRODUCTION

Orchardgrass and clover are the major pasture species sown in Korea. The ability of pasture legumes to fix nitrogen and to produce good quantities of forage is well known. It is also generally recognized that nutritive value of legumes is superior to that of most grasses.

The beneficial role of legumes in grazing systems has been reviewed by Ulyatt (1976) and Brown (1990) et al. They reported forage legumes had an advantage over grass in terms of animal performance, such as liveweight gain or milk yield.

Little information, however, is currently available regarding relative forage production, quality and animal performance of clover and alfalfa in grass/legume pastures. Therefore, this study was conducted to compare the forage yield, nutritive value and animal gain on some different grass/clover, grass/alfalfa and grass alone pastures for efficient grazing management.

MATERIALS AND METHODS

In 1991 and 1992, pasture productivity and animal performance on four different grass/legume pastures were examined with two replications. The grasses consisted of orchardgrass (OG), tall fescue, perennial ryegrass (PRG), and Kentucky bluegrass. The pasture mixtures used in this study were grasses (mainly OG) + ladino clover(T1), grasses (mainly OG) + alfalfa(T2), grasses (mainly PRG) + alfalfa(T3), and grasses only (mainly OG, T4).

The pastures were rotationally grazed 7 times every late April, mid-May, early June, late June, late July, late August, and late September, with growing Holstein heifers (1991) and beef heifers (1992), which had an initial weight of about 243 kg. Each grazing pasture was 0.2 ha and with two cows, and the pastures were divided into four small paddocks. The same amount of nitrogen, phosphorus, and potassium were applied at 280, 200 and 240 kg/ha respectively, in all treatments.

The livestock were weighed every end of month. Most energy (96%) of cows was supplied by forages. Small amounts (4%) of concentrate were provided during summer and autumn, and mineral supplement was provided throughout the grazing season. Plant height and forage yield were measured at each grazing period. Crude protein and calcium (AOAC, 1984), neutral detergent fiber (NDF) and acid detergent fiber (ADF) (Goering and Van Soest, 1970) were investigated every first grazing time. The percentage of legumes was measured at April (initial), September in 1991 (middle), and September in 1992 (final) by dry weight basis.

RESULTS AND DISCUSSION

Legume proportion: A summary of legume dominance by different grass/legume pastures during the grazing season is shown in Table 1. There was a significant difference between pasture mixtures in botanical composition. Initially, the percentage of legume ranged from 12(T3) to 21%(T1) on all legume treatments. However, ladino clover in T1 increased to 54-68%, on the other hand, the proportion of alfalfa was 15 to 23% in T2, and 12 to 19% in T3 throughout the grazing season. In most grass/clover pastures of Korea, pasture tended to be rapidly dominated by ladino clover.

Forage production and nutritive value: As shown in Table 1, the annual forage dry matter yield ranged from 9.19(T4) to 9.61MT/ha(T3), but there was no significant difference in forage yield for different grass/legume pastures. Most of the yield was produced in spring season, particularly in May.

The crude protein content of the forages was highest in T1(23.2%), lowest in T4(18.5%), and the contents of NDF and ADF were lowest in T1. Also the highest calcium content was found in T1(0.68%), and lowest in T4(0.13%).

In this experiment, high nutritive value of T1 was likely due to a high proportion of clover. Coinciding with these results, Ulyatt et al. (1976) reported that the superiority of legumes over grass was due to a higher nutritive value, a higher intake, and a higher ratio of protein/energy absorbed.

Animal performance: Liveweight gain by different grass/legume pastures is shown in Table 2. There was a significant difference ($P<0.05$) between treatments on animal gain, and a similar result was observed in both years of the experiment. The average daily gain(ADG) was greatest in T1(0.67kg), lower in T2(0.50kg), lower again in T3(0.49kg), and lowest in T4(0.39kg).

The liveweight gain per ha followed the same pattern : 1,073kg in T1, 810kg in T2, 784kg in T3, and 643kg in T4. The ADG by month was highest in May (0.82kg) but lowest in August (0.30kg), and the ADG was particularly low during August in T4.

These results confirmed observations made in several studies that performances of calves (Lancashire, 1971) and sheep (Brown, 1990) were affected by whether animals are grazed on grass alone or grass with clover. In this study, growing cows gained 67% more weight on a grass /ladino clover pasture than on a grass alone pasture which contained similar forage DM yield.

In conclusion, pasture mixtures which include legumes (particularly ladino clover) can increase animal performance. Thus grass/clover mixtures could be recommended. However, more research is required to investigate the rapid dominance of ladino clover, and to compare the carrying capacities of clover, alfalfa, birdsfoot trefoil and other legumes, and to compare the pasture productivity and persistence of the top- and bottom-grasses with legumes for efficient grazing management.

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Table 1

Legume proportion, dry matter (DM) yield, and nutritive value by different grass/legume pasture, 1991 and 1992.

	Legumes,%			Annual DM yield, MT/ha	Nutritive value,%			
	Init.	Mid.	Final		CP	NDF	ADF	Ca
Grasses(mainly OG)*+LC(T1)	21	68	54	9.42	23.2	51.8	28.4	0.68
Grasses(mainly OG)+ALF(T2)	15	23	17	9.40	19.5	52.0	29.4	0.41
Grasses(mainly PRG)+AL(T3)	12	19	15	9.61	19.1	53.0	30.0	0.29
Grasses alone(T4)	+	3	2	9.19	18.5	55.1	30.8	0.13
LSD, 0.05				NS				

NS: not significant, * OG:orchardgrass, LC:ladino clover, ALF:alfalfa, PRG:perennial ryegrass

Table 2

Animal performance by different grass/legume pastures, 1991 and 1992.

	Liveweight gain, kg				
	Daily Ave.	Per head Ave.	Per ha 91 92 Ave.		
Grasses(mainly OG)*+LC(T1)	0.67	107.3	1,080	1,066	1,073
Grasses(mainly OG)+ALF(T2)	0.50	81.0	815	804	810
Grasses(mainly PRG)+ALF(T3)	0.49	78.4	762	806	784
Grasses alone(T4)	0.39	64.3	552	733	643
LSD, 0.05	0.13	20.9	209		

* OG:orchardgrass, LC:ladino clover, ALF:alfalfa, PRG:perennial ryegrass