

Effects of Slope Exposure and Altitude on Productivity of Orchardgrass in Mountain Pasture

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山地草地에 있어서 傾斜方向 및 標高가 orchardgrass의 生産性에 미치는 影響

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摘 要

본 연구는 山地草地에 있어서 傾斜方向과 海拔標高가 牧草의 乾物生産量과 品質에 미치는 影響을 究明하고자 1986년부터 1987년까지 2년간 수행되었다.

1. 山地草地에 있어서 傾斜方向에 의한 orchardgrass의 乾物生産量과 粗蛋白質 含量은 北斜面이 南斜面보다 높았고, 南北 兩斜面 모두 標高가 높아짐에 따라서 乾物生産量과 粗蛋白質 含量이 增加하였다.
2. Neutral detergent fiber(NDF), acid detergent fiber(ADF) 含量 및 *in vitro* 乾物消化率은 傾斜方向間(南, 北) 그리고 標高間(250m, 350m, 500m)에 差異가 나타나지 않았다.

I. INTRODUCTION

The growth, dry matter yield, or nutrient uptake of pasture plants are different by the altitude, slope exposure, and sloping degree of mountain pasture (Bennett *et al.* 1972; Spurr and Banes, 1980). According to Bennett *et al.* (1972) and Lee *et al.* (1987), dry matter yield in some main grasses was higher on northern slope than that on southern slope. Therefore, the objective of this study was to investigate the effects of slope exposure (north and south) and altitude (250, 350, and 500 meters) on the dry matter yield and on the grass quality in mountain pasture for 2-year period from 1986 to 1987.

II. MATERIALS AND METHODS

This research was performed in 3 year old orchardgrass plots, southern mountain area in Korea, by applying fertilizers, which were nitrogen 280kg/ha, phosphate 200kg/ha, and potassium 240kg/ha per

year. The experiment was allocated on northern and southern slopes and altitudes of 250, 350, and 500 meters as a randomized block design with 4 replications.

Fertilizer was applied one time as basal and four times as top dressing per year. The samples from each plot were taken four times on May 20, June 20, August 20, and October 15 every year. The weather conditions of southern area in Korea is often droughty all the year round (Table 1).

III. RESULTS AND DISCUSSION

As shown in Table 2, dry matter yield by slope exposure in mountain pasture was higher on northern slope than that on southern slope (Bennett and Mathias, 1984; Lee *et al.* 1987). Dry matter yield of grasses on both sides of slope was increased by 11% and 9% as every 100 and 150 meters of altitude goes high, respectively. The content of crude protein, NDF, or ADF were more on higher altitude (Table

Table 1. Average climatic conditions during experimental period in Kwangju, Korea, 1986 and 1987

Item	Month	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.
Temperature (°C)		12.7	17.7	22.3	24.3	25.6	20.2	15.2
Precipitation (mm)		59.3	125.2	227.9	325.1	291.6	113.6	88.2
Sunshine (hr)		221.1	253.3	186.4	121.3	179.6	186.9	202.1

Table 2. Dry matter(DM) yield of mountain pasture

Slope exposure and altitude	DM yield (kg/ha)					Relative yield (%)
	1st cut	2nd cut	3rd cut	4th cut	Total	
South	3,547	1,359	1,734	1,249	8,256	100
North	4,091	1,531	2,126	1,829	9,576	116
250m	3,736	1,237	1,650	1,423	8,046	100
350m	3,938	1,545	1,902	1,527	8,911	111
500m	4,279	1,553	1,738	1,668	9,736	121

Table 3. Crude protein content of pasture plants growing at different slope exposure and altitude, and crude protein yield

Slope exposure and altitude	Crude protein content (%/DM)				Total yield (kg/ha)	Relative yield (%)
	1st cut	2nd cut	3rd cut	4th cut		
South	8.8	15.9	13.4	14.2	938.0	100
North	10.8	17.8	13.5	13.9	1,255.5	134
250m	9.1	14.1	12.3	12.8	904.0	100
350m	9.9	17.9	14.6	14.0	1,154.5	128
500m	10.4	18.6	13.6	15.4	1,296.2	143

Table 4. Neutral detergent fiber (NDF) content of pasture plants growing at different slope exposure and altitude, and NDF yield

Slope exposure and altitude	NDF content (%/DM)				Total yield (kg/ha)	Relative yield (%)
	1st cut	2nd cut	3rd cut	4th cut		
South	68.7	71.0	72.9	65.9	5,488.9	100
North	68.6	67.0	71.2	63.1	6,500.0	118
250m	68.0	68.2	71.6	64.5	5,477.4	100
350m	67.0	65.8	72.4	63.9	6,062.9	111
500m	69.5	73.0	72.3	65.2	6,794.7	124

3, Table 4 and Table 5). The content of crude protein was higher and the contents of NDF and ADF were lower on northern slope than those on sou-

thern slope (Bennett and Mathias, 1984; Kim, 1985). but, there was no significant in each content between different altitudes and between two different slopes.

Table 5. Acid detergent fiber (ADF) content of pasture plants growing at different slope exposure and altitude, and ADF yield

Slope exposure and altitude	ADF content (%/DM)				Total yield (kg/ha)	Relative yield(%)
	1st cut	2nd cut	3rd cut	4th cut		
South	39.2	38.7	53.4	43.8	3,389.4	100
North	38.2	37.6	50.6	41.8	3,978.8	117
250m	38.7	37.7	51.7	42.8	3,351.9	100
350m	37.7	38.3	51.3	43.4	3,701.0	110
500m	39.7	38.4	53.2	42.8	4,089.8	122

Table 6. *In vitro* dry matter (IVDM) digestibility of pasture plants growing at different slope exposure and altitude, and IV digestible DM yield

Slope exposure and altitude	IVDM digestibility (%/DM)				Total yield (kg/ha)	Relative yield(%)
	1st cut	2nd cut	3rd cut	4th cut		
South	53.1	60.7	46.6	50.7	4,149.6	100
North	53.7	60.1	45.2	50.8	5,007.1	121
250m	53.6	61.6	46.2	51.1	4,247.0	100
350m	52.8	60.0	45.9	51.0	4,655.6	110
500m	53.8	60.0	45.7	50.2	5,084.8	119

The yield of crude protein was higher by 34% on northern slope than that on southern slope and increased by 28 and 12% as the altitude is higher by 100 and 150 meters (Table 3).

The yields of NDF and ADF were higher by 18% and 17% on northern slope than those on southern slope. These yields were also increased by 11% and 12% in NDF, and 10% and 11% in ADF as the altitude is higher by 100 and 150 meters, respectively.

The digestibility of *in vitro* dry matter (IVDM) was not different between different altitudes and between two different slopes. However, the yield of *in vitro* digestible dry matter was higher by 21% on northern slope than that on southern slope. And, this yield was increased by 10% and 9% as the altitude is higher by 100 and 150 meters, respectively (Table 6).

IV. SUMMARY

This study was carried out to investigate the ef-

fects of slope exposure and altitude on the dry matter yield and on the grass quality in mountain pasture for 2-year period from 1986 to 1987.

1. Dry matter yield and crude protein content of grasses by slope exposure in mountain pasture were higher on the northern slope than that on the southern slope and, on both sides of slope, were increased as the altitude was high.
2. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) contents, and *in vitro* dry matter digestibility were not different between different slope exposures and between different altitudes.

V. REFERENCES

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