

Microbiota and Serum Metabolic Profile Changes in Korean Native Hanwoo Steer in Response to Diets Feeding System

Jeong Sung Jung ¹, Ilavenil Soundharrajan ¹, Dahye Kim ², Myunggi Baik ³, Seungmin Ha ⁴ and Ki Choon Choi ^{1,*}

1 Grassland and Forage Division, National Institute of Animal Science, Rural Development Administration, Cheonan 31000, Korea

2 Animal Genomics and Bioinformatics Division, National Institute of Animal Science, Wanju 55365, Korea

3 Department of Agricultural Biotechnology and Research Institute of Agriculture and Life Sciences, College of Agriculture and Life Sciences, Seoul National University, Seoul 08826, Korea

4 Dairy Science Division, National Institute of Animal Science, Rural Development Administration, Cheonan 31000, Korea

* Correspondence: choiwh@korea.kr; Tel.: +82-41-580-6752; Fax: +82-41-580-6779

Supplementary Table S1. Effects of feeding systems on Grazing on growth performance and feed intake in Hanwoo steers during growing period.

Items	Total period			
	Control (Housing)	Grazing	SEM	Pr>F
Initial body weight (kg)	260.80	219.80	14.70	0.16
Final body weight (kg)	376.40	415.00	11.50	0.26
Average daily gain (ADG, kg)	0.81	0.83	0.03	0.22
Feed intake (kg)	7.80	8.22	0.20	0.09
Concentrate (kg)	3.95	3.03	0.18	0.01
Rice straw (kg)	3.85	-	0.07	-
Grass/grazing (kg)	-	5.19	0.22	-
Feed efficiency	0.11	0.09	0.01	0.03
Feed conversion ration	9.63	11.10	0.62	0.02
Intake(kg)				
Crude protein	152.14	282.82	22.48	0.01
Total digestibility nutrients (TDN)	932.87	1,173.05	46.94	0.01

SEM: Standard error of Mean

Supplementary Table S2. Ingredient composition and chemical analysis of nutrients.

Items	Compositions (% DM)
<i>Ingredients</i>	
Cornflake	25
Wheat	18
Gluten feed	8
Tapioca residue	4.58
Wheat bran	11.79
Palm kernel meal	8
Coconut oil meal	3
Rapeseed meal	5
Soybean meal	7.39
disillers dried grains	2.22
Limestone	2.17
Molasses	3
Salt	0.81
Probiotics	0.05
Magnesium oxide	0.3
Sodium bicarbonate	0.3
Vitamin premix ^a	0.21
Mineral premix ^b	0.18
Total	100
<i>Chemical compositions</i>	
Dry matter (DM)	88.23
Crude protein (CP)	16.36
Ether extract	11.25
Crude fiber	26.78
Acid detergent fiber (ADF)	22.5
Neutral detergent fiber (NDF)	35.50
Total digestible nutrient (TDN)	74.68

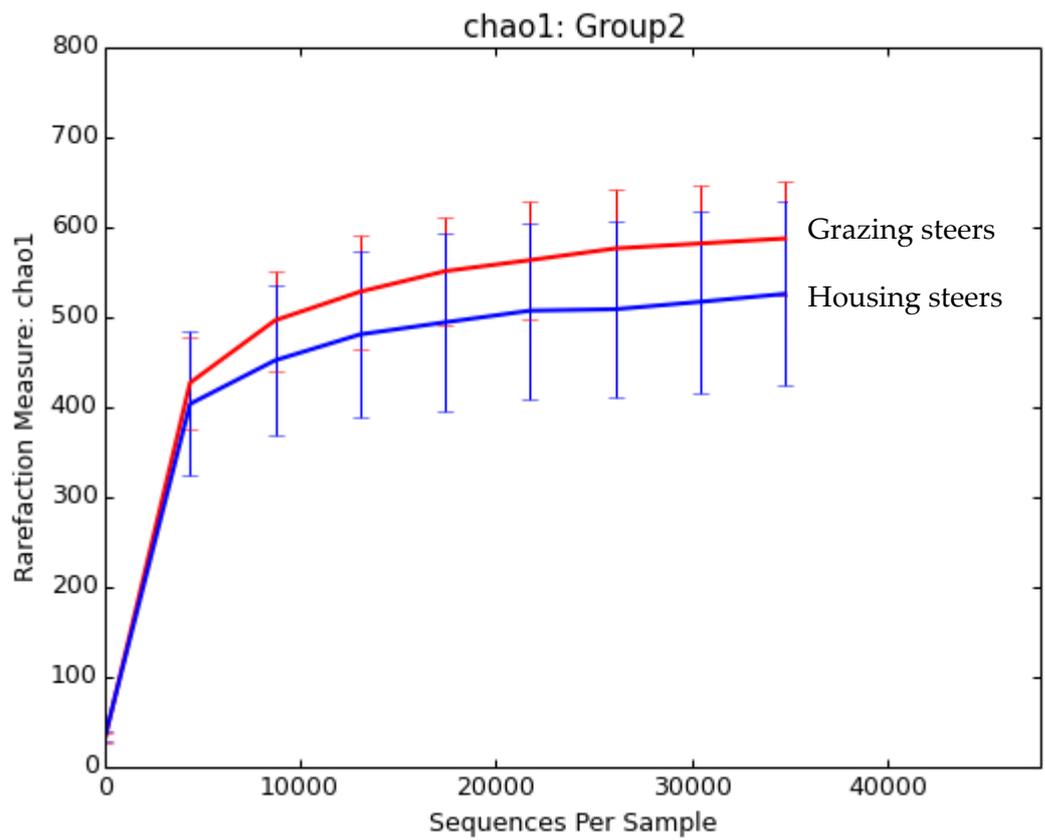
^aVitamin premix contained the following ingredients diluted in cellulose (g/kg premix): L-ascorbic acid, 121.2; DL- α -tocopherol acetate, 18.8; thiamine hydrochloride, 2.7; riboflavin, 9.1; pyridoxine hydrochloride, 1.8; niacin, 36.4; Ca-D-pantothenate, 12.7; myoinositol, 181.8; D-biotin, 0.27; folic acid, 0.68; p-aminobenzoic acid, 18.2; menadione, 1.8; retinal acetate, 0.73; cholecalciferol, 0.003; cyanocobalamin, 0.003. ^bMineral premix contained the following ingredients (g/kg premix): Mg SO₄ 7H₂O, 80.0; NaH₂PO₄ 2H₂O, 370.0; KCl, 130.0; ferric citrate, 40.0; ZnSO₄ 7H₂O, 20.0; Ca-lactate, 356.5; CuCl, 0.2; AlCl₃ 6H₂O, 0.15; KI, 0.15; Na₂Se2O₃, 0.01; MnSO₄ H₂O, 2.0; CoCl₂ 6H₂O, 1.0. Concentrate feed was provided by NongHyup Company. ^cVitamin premix contained the following ingredients (Power Vitamine, Genobio, Republic of Korea) : Vitamin A, 6,000,000IU; Vitamin D3, 1,200,000 IU; Vitamin E, 1,000mg; Vitamin B1, 500mg; Vitamin B2,

500mg; Vitamin B6, 500mg; Vitamin B12, 10mg; Protected Vitamin C, 5,000mg; Pantothenic acid, 1,000mg; Niacin, 1,000mg; Biotin, 30mg; Folic acid, 600mg; Mn, 100mg.

Supplementary Table S3. Nutrient compositions of rice straw and grass during growing period

Item (% DM)	Rice straw	Grass/Grazing						
		May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov
DM	88.82±0.36	22.50±2.04	30.00±4.02	34.66±2.94	31.32±0.17	27.32±0.82	29.73±0.29	30.02±0.44
CP	4.45±0.02	12.37±0.47	12.05±1.08	14.51±0.04	13.57±0.47	18.60±0.27	15.37±0.42	15.63±0.49
ADF	42.20±0.22	30.61±0.70	39.47±1.06	40.24±0.14	41.48±0.58	38.43±0.49	35.07±0.39	32.95±0.79
NDF	68.99±0.08	54.22±0.04	64.32±0.72	61.29±1.24	60.57±0.85	60.04±0.87	57.26±0.36	55.68±0.72
TDN	55.56±0.17	64.72±0.55	57.72±0.84	57.11±0.11	56.13±0.46	58.54±0.39	61.19±0.31	62.87±0.63
IVDMD	40.07±0.87	75.58±1.28	70.62±2.38	71.19±0.61	71.39±0.56	73.18±0.65	74.56±0.57	74.70±0.74

DM: Dry matter, CP: crude protein, AFD: Acid detergent fiber , NDF: Neutral detergent fiber, TDN: Total digestible nutrient, IVDMD: In vitro dry matter digestibility



Supplementary Figure S1. A rarefaction analysis of the fecal microbiota of grazing and housing steers