Growth Performance and Carcass Traits of Fattening Hanwoo Steers Housed on Fully straw-bedded floors with different groups

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Abstract

The study was performed to compare growth performance, behaviour, carcass traits and meat quality of fattening Hanwoo Steers housed on fully straw-bedded floors with different groups. From 12 to 21 months of age, forty-eight Hanwoo steers were assigned to three groups: small, medium and large, two replicates. Concentrate feed were offered 4.0 kg per-head per-day initially and gradually increased by 0.5 kg per-head per-day monthly until 21 months. After 21 months of age, all animals were regrouped to 4 heads per pen with freely access to concentrate feed. Rice straw was available at all time during experimental period. A constant space allowance of 8.82 m^2/head was adopted over the trial. Behaviour was video recorded at two minutes interval for 10 h starting at 08:00 am. Live carcass traits were evaluated every 3 months until animals were slaughtered at 30 months to determine carcass traits. The results indicated that space allowance set at 8.82 m^2 per-animal was sufficient for animal performing most of behaviors. Groups did affect animal growth rate and back fat layer which mainly be focused on early fattening stage. Housed under medium group might be some help in improving beef quality grade of Hanwoo steers.

Introduction

Fattening Hanwoo steers for practical reasons are usually kept 4 to 12 heads forming a dynamic group based on their fattening characteristics and local environmental conditions in a full concrete slatted floor because of the low labor cost and none bedding material is needed. However, steers raised on bedding floors were found better growth performance than on slatted floor which was not affected by space allowance (Hardy, 1980). Thus aimed at improving rearing condition and achieving a better understanding of the effects of group and fully straw-bedded system on beef cattle under an intensive system, the present study was conducted to compare growth performance, behaviour, live body carcass traits and meat quality of Hanwoo steers housed on fully straw-bedded floors with different groups

Materials and methods

In phase 1, 12 to 21 months of age, forty-eight Hanwoo steers (initial live weight = 304.51 ± 12.40 kg) were assigned to three groups (two replicates): small, medium and large, consisting of 4, 8 and 12 heads, respectively. They were allotted to six pens with fully straw-bedded floors. Introducing to pens was performed at 9:30 pm, three weeks prior to the start of experiment, allowing steers to be familiar with each other and accustomed to the facilities and daily routines. In phase 2, all animals housed on medium and large groups were regrouped according to live weight to 4 heads in respective treatment. Space allowance was accommodated at 8.82 m^2 per animal over the trial. Common diets comprising of concentrate and forage were provided to all the animals in a single daily distribution at 07:00 h. Concentrate feed (corn-based) was initially offered 4.0 kg per-head per-day and gradually increased by 0.5 kg monthly until 21 months. Bale rice straw and clean water were available throughout the trial. Six days' video recorded behaviour in each phase was sampled for final analysis. Live weight was measured and recorded at the beginning of each image processing. Images of live animal back fat thickness, rib-eye area and marbling score were processed every three months by using an ultrasound instrument (HS-2000, Japan) at the left side of 13th rib and

lumber vertebrae interface. Health status was visually monitored daily for each steer and any pathological event and medical treatment was recorded during the trial. At 30 months of age, all animals were slaughtered at commercial slaughterhouses and carcasses were graded according to the Animal Products Grading Service (APGS, 2004). Statistical analysis was performed using the SPSS package (SPSS 7.5, 1996).

Results and discussion

No sickness or injury was observed in any of the Hanwoo steers during the experimental period.

Behavioral observations showed that Large group increased ($P<0.05$) animal walking time but decreased ($P<0.05$) their grooming frequencies. Eating time was not affected by group size. When all animals were regrouped to 4 heads, no differences were found on behavior among treatments. This indicated space allowance accommodated at 8.82 m^2/head was enough for animals performing most of behaviour and group size played an important role in affecting animal behaviour.

Table 1. Growth and ultrasound back fat layer of fattening Hanwoo steers housed on different groups

		Group size			SEM
		Small	Medium	Large	
Initial body weight (kg)		303.34	299.06	311.12	12.40
Final body weight (kg)		714.95	694.58	698.53	37.25
Average daily gain (g)					
	12 – 15	816.78	772.89	657.67	84.54
	15 - 18	777.44[a]	510.44[b]	617.22[b]	64.62
	18 – 21	875.11[b]	1236.33[a]	967.11[b]	76.58
Month	12 - 21	769.72[b]	838.89[a]	747.33[b]	47.84
	21 - 24	653.11	612.67	624.67	56.93
	24 - 27	839.33	744.00	719.33	82.46
	27 - 30	611.67	518.33	685.22	78.65
	21 - 30	701.37	625.00	676.41	94.38
Ultrasound back fat layer (mm)					
	12	1.55	1.17	1.23	1.07
	15	2.51[a]	1.48[b]	1.32[b]	0.86
	18	3.84[a]	2.19[b]	2.32[ab]	1.45
	21	5.33	3.63	4.15	1.82
Month	12 - 21	3.78[a]	2.46[b]	2.92[b]	0.43
	21	5.33	3.63	4.15	1.82
	24	5.82	4.98	4.89	2.22
	27	7.06	6.88	6.32	2.08
	30	9.83	9.69	9.80	2.77
	21 - 30	4.50	6.06	5.65	2.58

[a-b] Values with different superscripts significantly differ at $p<0.05$

SEM = Standard error of mean (n = 48)

No significant difference was found on ultrasound rib-eye area and marbling score among groups over the trial. Differences of animal average daily gain and ultrasound back fat layer among groups were mainly focused on the early fattening stages, from 12 to 21 months of age (Table 1). At around 21 months of age, animals would reach a steadily growing stage. So that it is essential strengthen management and nutritional level on early fattening stages.

Table 2. Carcass quality grade of yearling Hanwoo steers housed under different groups

Trait	Group size			SEM
	Small	Medium	Large	
Final live weight, kg	714.95	694.58	698.53	37.25
Warm carcass weight, kg	425.01	424.42	412.73	18.16
Dressing percent, %	59.45	61.10	59.09	5.37
Back fat thickness, mm	11.02	8.58	10.83	2.34
Rib-eye area, cm^2	86.09	90.92	84.43	8.57
Yield grade[1]	65.51	67.69	65.84	5.73
Grade exceeds "1 A", %	12.5	43.8	33.3	—
Marbling score[2]	5.3	5.6	5.5	1.7
Meat color[3]	4.8	4.9	4.9	0.4
Fat color[4]	2.8	2.9	2.8	0.4
Firmness[5]	1.3	1.4	1.3	0.5
Maturity[6]	2.0	2.0	2.0	0.0

[1] Yield grade: ≥ 67.5 = A, 67.5 - 62.0 = B, < 62.0 = C

Yield grade equation: 68.184 – 0.625 x Back fat thickness (mm) + 0.130 x Rib-eye area (cm^2) – 0.024 x Warm carcass weight (kg) + 3.23 (for only)

[2] Marbling score: 1 = devoid, 9 = very aboundant (in APGS of Korean, ≤ 1 = "3" grade, 2 - 3 = "2" grade, 4 - 5 = "1" grade, 6 - 7 = "1^+"grade , and 8 - 9 = "1^{++}"grade)

[3] Meat color: 1 = scarlet, 7 = dark red

[4] Fat color: 1 = creamy white, 7 = yellow

[5] Firmness: 1 = firm, 3 = soft

[6] Maturity: 1 = youthful, 3 = mature

[a-b] Values with different superscripts significantly differ at $p<0.05$

SEM = Standard error of mean (n = 48)

Animals raised in medium group showed the highest yield grade (mean level reached "A" grade) and the largest percentage (43.8%) of meat grade exceeded "1 A" (Table 2). It indicated that housed Hanwoo steers under a medium group might be some help in improving meat quality grade.

References

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