ORIGINAL PAPER 원저

건조 남은음식물 급여가 육성돈과 비육돈의 생산성에 미치는 효과

조영무*, 김광현**, 고홍범**, 정일병*, 이지웅*, 배인휴***, 양철주***
축산연구소*, 전남대학교**, 순천대학교***
540-742, 전남 순천시 매곡동 350번지 순천대학교 동물자원과학과 Tel : 061-750-3235 Fax : 061-750-3239 E-mail : yangcj@sunchon.ac.kr
(2004년 5월 24일 접수, 2004년 6월 18일 채택)

Effects of Feeding Dried Leftover Food on Productivity of Growing and Finishing Pigs

Y.M. Cho*, K.H. Kim, H.B. Koh**, I.B.Chung*, G.W. Lee*, I.H. Bae*** and C.J. Yang*****

National Livestock Research Institute*, Chonnam National University**, Sunchon National University***

ABSTRACT

These studies were conducted to investigate the effects of feeding dried leftover food (DLF) on growth, feed conversion and carcass characteristics of growing and finishing pigs. In experiment 1, seventy-five three-way cross-hybrids (Yorkshire×Landrace×Duroc) pigs weighing approximately 22 kg of body weight on average were assigned to five treatments in a completely randomized design. Each treatment had three replications with five pigs per replication. All pigs were fed experimental diets for 60 days. In experiment 2, seventy-five three-way cross-hybrids pigs weighing approximately 70 kg of body weight were fed experimental diets for 49 days. Each treatment had three replications with five pigs per replication. The treatments included 1) group offered control diet without DLF, 2) group offered diet containing DLF at 25%, 3) group offered diet containing DLF at 50%, 4) group offerred diet containing DLF at 25% with 10% higher protein level and 5) group offerred diet containing DLF at 50% and 20% higher protein level.

Average daily gain of growing pigs was highest in control group among all the treatment groups except group offered diet containing DLF at 25% with no significant difference ($P>0.05$). Feed intake of DLF-offered groups were lower than that of control group while feed intake of groups fed diets containing DLF at 50% with 20% higher protein level was significantly higher ($P<0.05$) than that of control group. Feed conversion of growing pigs was not significantly different amont treatments although it seemed to be slightly improved in groups fed diets containing DLF at 25%. Average daily gain of finishing pigs fed diets containing DLF was significantly lower than that of control group. However there was no significant differences in average daily gain between groups fed diets containing DLF at 25% with 10% higher protein level and control group ($P>0.05$). Feed

intakes were significantly decreased in DLF-fed groups compared to control group while there was no significant differences in feed intake between groups fed diets containing DLF with 10% and 20% higher protein levels and control group (P>0.05). Feed conversion was lowest in groups fed diets containing DLF at 25% with 10% higher protein level. However, there were no significant differences in feed conversion between groups fed diets containing DLF at 25% with 10% higher protein level and control group. Feed conversion of groups fed diets containing DLF at 50% was significantly higher than that of control group (P<0.05). Carcass weight was decreased with increasing levels of DLF in the diets. There were no significant differences in dressing percentage, backfat thickness and carcass grade among treatments. Feed cost per 1 kg body weight gain of finishing pigs was lowest in groups fed diets containing DLF at 25% with 10% higher protein level.

Key words: Pigs, Dried leftover food, Growth performance, Feed intake, Carcass characteristics

초 록

육성돈 시험은 평균체중이 약 22 kg 내외인 3원교잡종 (Yorkshire × Landrace × Duroc) 75두를 공시하여, 건조 남은음식물 무첨가구 (Control), 25%, 50% 첨가구와 사료내 단백질 함량을 10% 보강한 건조 남은음식물 25% 첨가구 및 단백질 함량을 20% 보강한 건조 남은음식물 50% 첨가구 등 총 5개 처리구로 하여 60일간 사양시험을 실시하였다. 육성돈의 일당증체량은 대조구가 모든 처리구중에서 가장 높았으나 건조 남은음식물 25% 첨가구와는 차이가 없었다 (P>0.05). 사료섭취량은 건조 남은음식물 첨가구가 대조구에 비해 다소 낮았으나 큰 차이는 없었고, 건조 남은음식물 첨가구중에서는 단백질을 20% 보강한 건조 남은음식물 50% 첨가구의 사료섭취량이 유의적으로 높았다 (P<0.05). 사료요구율은 처리간에 유의적인 차이는 없었으나, 건조 남은음식물 25% 첨가구가 다소 개선되는 경향이었다.

비육돈 시험은 평균체중이 약 70 kg 내외인 3원교잡종 (Yorkshire × Landrace × Duroc) 75두를 공시하여 49일간 사양시험을 실시하였으며, 처리내용은 육성돈의 시험과 같다. 비육돈의 일당증체량은 대조구에 비해 건조 남은음식물 첨가구가 유의적으로 낮았으나 단백질을 10% 보강한 건조 남은음식물 25% 첨가구는 대조구와 차이가 없었다 (P>0.05). 사료섭취량은 대조구에 비해 건조 남은음식물 첨가구가 유의적으로 감소하였으나 단백질을 보강한 건조 남은음식물 첨가구는 대조구와 차이가 없었다 (P>0.05). 사료요구율은 단백질 함량을 10% 보강한 건조 남은음식 물25% 첨가구가 가장 낮았으나 대조구와는 차이가 없었고, 50%첨가구는 유의적으로 높았다 (P<0.05). 도체중은 건조 남은음식물의 첨가수준이 증가할수록 낮아지는 경향이었으며, 도체율, 등지방두께 및 도체등급은 처리간에 차이가 없었다. 비육돈의 1 kg 증체당 사료비는 단백질 함량을 10% 보강한 건조 남은음식물 25% 첨가구가 가장 적게 소요되었다.

핵심용어: 돼지, 건조 남은음식물, 발육, 사료섭취량, 도체특성

1. INTRODUCTION

The ratio of feed cost to total production cost is more than 70% in swine production, thus, many efforts were made to decrease feed cost. Leftover foods are annually

generated 4.22 million tons with value of 8 trillion won during 1999 in Korea. However, only 34% out of total leftover foods were recycled and the remaining were landfilled or incinerated. And only 20% of total leftover foods were recycled as a feed, which have a potential to substitute a certain portion of feed ingredients contributing to decrease feed cost portion out of total production cost. By substituting certain amount of feed ingredient with leftover food, the cost of swine production will be decreased and thereby competitiveness of swine industry will be improved. In addition to economical advantage, environmental pollution associated with swine manure will be reduced. When leftover food is used as a feed ingredient, swine farmers must take into account of optimal inclusion level of leftover food in their feeds and its effect on growth and carcass characteristics.

Leftover food has been used as a feed for animals being raised near the metropolitan area in many countries for a long period[3,21]. Kornegay et al. (1965) reported that when leftover food was provided to swine, digestibility of feeds confaining leftover foods was similar to that of commercial feed[9]. Several researchers pointed out the values of leftover foods as a feed[5,7,8] and feeding value in swine[1,6,9,10,11,13]. Westendorf et al. (1996) proposed that recycling of leftover food as a feed should be rather cost-effective than waste disposal[21].

Utilization of leftover food as an ingredient for animal feed poses several problems derived from variations in nutritional composition due to diversity of ingredients mixed into leftover food and various processing methods[12,18], however nutritional value of leftover food as feed was generally well known like other feedstuffs. Sebek et al. (1990) observed that feeding leftover foods to pigs resulted in similar daily weight gain to that of control[20]. Optimum inclusion level of leftover foods in feeds for swine was proposed 30%[14,20].

Myer et al. (1999) reported that leftover food could be used as supplemental feed or raw-materials for diets for pig or chicken[15]. Nam et al. (2000) found that daily weight gain, feed conversion, and carcass weight were similar to those fed a commercial swine feed when leftover food was added up to 30% of the diet for growing-finishing pigs in the process of pellet[16]. Chae et al. (2000) proposed that optimum level of leftover foods in swine feeds would be about 20%. When they substituted 20% of the diet for growing pigs with dried leftover foods, no significant differences in daily were gain were detected compared to control group. However daily weight gain was significantly decreased when dried leftover foods substituted over 30% of the diet[2]. The objectives of these studies were to investigate the effects of feeding diets containing different levels of dried leftover foods on growth, feed utilization, and carcass characteristics of growing and finishing pigs.

2. MATERIALS AND METHODS

2.1 Exp.1: Effects of Feeding Diets Containing Different Levels of Dried Leftover Food on Growth Performance of Growing Pigs

2.1.1 Animals and Experimental Design

Seventy-five three-way cross hybrids

[Table1] Formula and Chemical Composition of Experimental Diets Fed to Growing Pigs

Item	Control	DLF* 25%	DLF 50%	AP*10+ DLF25%	AP20+ DLF50%
Ingredients					
Corn	70.55	53.65	34.15	47.47	21.60
Dried leftover food	0.00	25.00	50.00	25.00	50.00
Soybean meal-45	23.52	14.50	5.80	20.68	18.34
Fish meal	3.30	3.30	3.30	3.30	3.30
Tallow	0.96	2.92	5.87	2.96	5.96
Salt	0.30	0.00	0.00	0.00	0.00
Vit.-Min. premix[1)]	0.30	0.30	0.30	0.30	0.30
Antibiotics	0.10	0.10	0.10	0.10	0.10
Lysine-HCL	0.00	0.23	0.46	0.19	0.37
Methionine	0.00	0.00	0.02	0.00	0.03
Limestone	0.45	0.00	0.00	0.00	0.00
Tricalcium phosohate	0.52	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00
Chemical composition[2)]					
ME (kcal/kg)	3,400	3,400	3,400	3,400	3,400
CP (%)	18.00	18.00	18.00	20.25	22.50
Lys (%)	0.95	0.95	0.95	1.07	1.19
Met (%)	0.32	0.28	0.25	0.31	0.31
Ca (%)	0.60	1.17	2.08	1.19	2.12
P (%)	0.50	0.52	0.63	0.54	0.68

1) Vitamin-mineral mixture contains following nutrients per kg : Vit. A, 6,000,000 IU; Vit. D_3, 1,200,000 IU; Vit. E, 15,000 IU; Vit. K, 2,400 mg; Vit. B_1, 1,700 mg; Vit. B_2, 3,000 mg; Vit. B_6, 3,000 mg; Vit. B_{12}, 15 mg; Pantothenic acid, 12,000 mg; Niacin, 14,000 mg; Biotin, 120 mg, Folic acid, 670 mg; Fe, 50,000 mg; Cu, 10,000 mg; Mn, 10,000 mg; Zn, 80,000 mg; I, 160 mg; Se, 150 mg.
2) Calculated value.
* DLF: Dried leftover food, AP: Additional protein based on control.

(Yorkshire×Landrace×Duroc) pigs with approximately 22 kg of body weight were assigned to five treatments in a completely randomized design. Each treatment had three replications with five animals per replication. All animals were fed experimental diets for 60 days. The treatments included control diet without dried leftover foods (DLF), diet containing 25% DLF, diet containing 50% DLF, 10% higher protein level of diet containing 25% DLF and 20% higher protein level of diet containing 50% DLF.

2.1.2 Experimental Diets and Feeding

The experimental diets used in these studies were formulated according to nutrient requirements suggested by NRC[17)] for growing pigs. [Table 1] shows ingredients and chemical composition of experimental diets. Dried leftover food was processed using fluidized bed dry method in support of local leftover food processing company (Samneung construction Inc. Gwangju. Korea). Chemical compositions of DLF were as follows: 93.70% dry matter, 20.62% crude protein, 9.99% crude fat, 8.87% crude fiber, 13.67% crude ash, 0.41% lysine and 0.18% methionine. Experimental diets were fed ad libitum and fresh water was supplied by automatic waterer. And other managements followed the routine practise of the swine farms.

2.1.3 Measurements

Body weights were measured at each initial and final day of the trial individually. Body weight gain and average daily gain were calculated as follows:

Body weight gain = final weight − initial weight

Average daily gain = body weight gain / No. of days from the beginning to the end

Feed intake was determined by measuring feed residue on weekly basis since the beginning of the experiment. Feed conversion was calculated by dividing daily feed intake by daily weight gain. Economical efficiency was represented as feed cost required to gain 1 kg body weight.

2.1.4 Statistical Analysis

Differences among treatment means were assessed using Duncan,s Multiple Range Test using SAS[4,19].

2.2 Exp.2: Effects of Feeding Dried Leftover Food on Productivity of Finishing Pigs

2.2.1 Animals and Experimental Design

Seventy-five three-way cross hybrids (Yorkshire×Landrace×Duroc) pigs with approximately 70 kg of body weight were assigned to five treatments in a completely randomized design. Each treatment has three replications with five animals per replication. All animals were fed experimental diets for 49 days. Each treatment included control diet without DLF, diet containing 25% DLF, diet

[Table2] Formula and Chemical Composition of Experimental Diets Fed to Finishing Pigs

Item	Control	DLF 25%	DLF 50%	AP10+ DLF25%	AP20+ DLF50%
Ingredients					
Corn	82.15	65.63	43.18	60.18	36.71
Dried leftover food	0.00	25.00	50.00	25.00	50.00
Soybean meal-45	14.90	5.70	0.00	10.50	6.42
Tallow	1.18	3.03	6.04	3.37	6.10
Salt	0.30	0.00	0.00	0.00	0.00
Vit.-Min. premix[1)]	0.30	0.30	0.30	0.30	0.30
Antibiotics	0.10	0.10	0.10	0.10	0.10
Lysine-HCL	0.00	0.24	0.38	0.19	0.36
Methionine	0.00	0.00	0.00	0.00	0.01
Limestone	0.52	0.00	0.00	0.00	0.00
Tricalcium phosohate	0.55	0.00	0.00	0.36	0.00
Total	100.00	100.00	100.00	100.00	100.00
Chemical composition					
ME (kcal/kg)[2)]	3,400	3,400	3,400	3,400	3,400
CP (%)	13.20	13.20	14.18	14.85	16.50
Lys (%)	0.60	0.60	0.60	0.68	0.75
Met (%)	0.23	0.19	0.16	0.21	0.20
Ca (%)	0.45	0.98	1.90	1.11	1.92
P (%)	0.40	0.41	0.54	0.50	0.56

1) Vitamin-mineral mixture contains following nutrients per kg : Vit. A, 6,000,000 IU; Vit. D_3, 1,200,000 IU; Vit. E, 15,000 IU; Vit. K, 2,400 mg; Vit. B_1, 1,700 mg; Vit. B_2, 3,000 mg; Vit. B_6, 3,000 mg; Vit. B_{12}, 15 mg; Pantothenic acid, 12,000 mg; Niacin, 14,000 mg; Biotin, 120 mg, Folic acid, 670 mg; Fe, 50,000 mg; Cu, 10,000 mg; Mn, 10,000 mg; Zn, 80,000 mg; I, 160 mg; Se, 150mg.

2) Calculated value.

containing 50% DLF, 10% higher protein level (AP10) of diet containing 25% DLF and 20% higher protein level (AP20) of diet containing 50% DLF.

2.2.2 Experimental Diets and Feeding

The experimental diets used in this study were formulated according to nutrient requirements suggested by NRC[17] for late finishing pigs. [Table 2] shows ingredients and chemical composition of experimental diets. Experimental diets were fed ad libitum and fresh water was supplied by automatic waterer. Other managements followed routine practices of the farms.

2.2.3 Measurements

Body weights were measured at the beginning and end of the trial individually. Body weight gain and average daily gain were calculated as follows:

Body weight gain = final weight − initial weight

Average daily gain = body weight gain / No. of days from the beginning to the end

Feed intake was determined by measuring feed residue on weekly basis since the beginning of the experiment. Feed conversion was calculated by dividing daily feed intake by daily weight gain. At the end of each feeding phase during the trial, all animals were slaughtered at the inspection facility of Naju Agricultural Cooperative. Carcass weight, dressing percentage and backfat thickness were measured and carcass grades based on local carcass grading standard were recorded. Economical efficiency was represented as feed cost required to gain 1 kg of body weight.

2.2.4 Statistical Analysis

Differences among treatment means were assessed using Duncan,s Multiple Range Test using SAS[4,19].

3. RESULTS AND DISCUSSION

3.1 Exp.1: Effects of Feeding Diets Containing Different Levels of Dried Leftover Food on Growth Performance of Growing Pigs

3.1.1 Body Weight Gain and Feed Utilization

Average daily gain, feed intake and feed conversion of growing pigs fed experimental diets are shown in [Table 3]. Average daily gain of control group (528.3 g) was higher than those of other treatments. Average daily gain of 25% DLF−fed group (513.3 g) was

[Table3] Effects of Feeding DLF on the Growth Performance of Growing Pigs

Item	Control	DLF25%	DLF50%	AP10+ DLF25%	AP20+ DLF50%
Initial BW(kg)	22.2±0.391)	22.3±0.75	22.5±0.48	23.9±0.64	23.1±0.53
Final BW(kg)	53.9±0.64^{a}	53.1±0.43^{a}	50.9±0.53^{b}	52.4±0.62^{ab}	50.1±0.60^{b}
ADG (g)	528.3±12.18^{a}	513.3±9.88^{a}	473.3±14.53^{b}	475.0±13.21^{b}	450.0±13.61^{bc}
ADFI (g)	1,167±40.01^{ab}	1,108±32.50^{b}	1,135±21.67^{b}	1,000±41.67^{bc}	1,252±43.34^{a}
Feed/gain	2.21±0.08	2.16±0.06	2.40±0.05	2.11±0.09	2.78±0.10

1) Means±SE.
^{a,b,c} Means in the same row with different superscripts differ significantly (P<0.05).

higher than other DLF-fed groups although there were no significant differences in ADG between control group and 25% DLF-fed group (P>0.05). From this result, feeding DLF to growing pigs resulted in decrease in ADG. Feed intakes of DLF-fed groups were lower than that of control. Feed intake of groups fed diets with 20% higher protein level and 50% DLF was significantly (P<0.05) higher than those of the other DLF-fed groups. No significant differences were found in feed conversion among treatments. But the group fed diets containing 25% DLF seemed to be improved in feed conversion regardless of dietary protein level.

These results coincided well with those by Chae et al. (2000) who reported that when diets containing 20% DLF were fed to growing pigs, there was no significant difference in body weight gain and feed conversion, while body weight gain was decreased and feed conversion was increased when diets containing 40% DLF were fed[2]. On the other hand, Nam et al. (2000) reported that body weight gain and feed conversion were not different among treatment groups and control group when diets containing 30% DLF were fed to growing-finishing pigs[16].

3.1.2 Economic Analysis

[Table 4] shows the effects of feeding DLF on economic efficiency of growing pigs. The cost per kg of experimental diets including DLF were lower than that of control diet. Increasing dietary level of DLF decreased feed cost per kg. Use of dried leftover food also decreased feed cost per 1 kg of body weight gain. Feed cost per kg of body weight gain was lowest in groups fed diets containing 25% DLF regardless of dietary protein level while highest in groups fed diets containing

[Table4] Effects of Feeding DLF on Economic Efficacy of Growing Pigs

Item	Control	DLF 25%	DLF 50%	AP10+ DLF25%	AP20+ DLF50%
Total feed intake (kg)	70.0	66.5	68.1	60.0	75.1
Feed cost (won/kg)	193.9	178.7	167.7	187.9	186.3
Total feed cost (won)	13,573.0	11,883.6	11,420.4	11,274.0	13,991.1
Total weight gain (kg)	31.7	30.8	28.4	28.5	27.0
Feed cost per kg BW. gain (won)	428.2	385.8	402.1	395.6	518.2

[Table5] Effects of Feeding DLF on the Growth Performance of Finishing Pigs

Item	Control	DLF25%	DLF50%	AP10+ DLF25%	AP20+ DLF50%
Initial BW (kg)	72.8±0.421)	71.5±0.67	71.2±0.62	71.5±0.67	72.3±0.48
Final BW (kg)	108.0±0.72a	96.8±1.19b	91.3±0.76c	105.3±1.17a	98.5±1.17b
ADG (g)	717.3±9.20a	516.9±11.15b	409.2±7.76c	688.8±12.11a	534.5±15.34b
ADFI (g)	2363±63.06a	2028±82.04ab	1824±60.31b	2042±73.16ab	2454±153.98a
Feed/gain	3.29±0.09bc	3.92±0.16ab	4.46±0.15a	2.97±0.11c	4.59±0.29a

1) Means±SE.
a,b,c Means in the same row with different superscripts differ significantly (P<0.05).
BW: Body weight, ADG: Average daily gain, ADFI: Average daily feed intake.

50% DLF with 20% higher protein level. Although feed intake tended to be higher in groups fed diets containing DLF than control group, body weight gain tended to be lower.

3.2 Exp.2: Effects of Feeding Dried Leftover Food on Productivity of Finishing Pigs

3.2.1 Body Weight Gain, Feed Intake and Feed Requirement

Average daily gain, feed intake and feed efficiency of finishing pigs fed experimental diets containing different levels of DLF are shown [Table 5]. Average daily gain of control group (717.3 g) was higher than those of groups fed diets containing DLF. Average dairy gain of groups fed diets containing 25% DLF with 10% higher protein level (688.8 g) was higher than groups fed diets containing DLF although there were no significant difference in ADG between control groups and groups fed diets containing 25% DLF with 10% higher protein level ($P>0.05$). From this result, DLF inclusion in swine diets tended to decrease ADG despite of increasing dietary protein by 10 and 20%. Increasing dietary level of DLF tended to decrease body weight gain while showing a significant reduction in groups fed diets containing 50% DLF ($P<0.05$). Feeding dried leftover food to pigs tended to decrease daily feed intake while showing a significant decrease in daily feed intake in groups fed diets containing DLF 50% compared to control. Increasing dietary level of DLF resulted in increasing feed conversion and reached a peak at dietary 50% of DLF, however, groups fed diets containing 25% DLF with 10% higher protein level showed an improved feed conversion.

These results were good agreement with other results that increasing dietary level of DLF decreased average daily gain and feed intake[2,22]. But these results were contrary to the results observed by Myer et al. (1999) that supplying leftover foods up to 40% in the diet to finishing pigs did not change average daily gain and feed conversion[15].

3.2.2 Carcass Characteristics

At the end of the trial, pigs were slaughtered to investigate carcass traits such as carcass weight, dressing percentage, backfat thickness and carcass grade [Table 6]. Carcass weight was decreased with increasing dietary level of DLF. The group

[Table6] Effects of Feeding DLF on Carcass Characteristics of Finishing Pigs

Item	Control	DLF 25%	DLF 50%	AP10+ DLF25%	AP20+ DLF50%
Slauther wt. (kg)	108.0±0.72^{a}	96.8±1.19^{b}	91.3±0.76^{c}	105.3±1.17^{a}	8.5±1.17^{b}
Carcass wt. (kg)	81.9±1.57^{a}	73.0±2.06^{ab}	68.2±1.57^{b}	79.1±2.05^{a}	73.5±1.39^{ab}
Dressing (%)	75.9±1.69	75.3±1.26	74.7±1.18	75.3±2.42	74.6±0.92
Back fat (mm)	24.7±1.48	22.1±1.28	20.1±0.84	22.1±1.62	20.0±1.33
Carcass grade (head)					
A	2(13.3)*	3(20.0)	1(6.6)	2(13.3)	2(13.3)
B	9(60.0)	7(40.6)	9(60.0)	8(53.3)	9(60.0)
C	3(20.0)	4(26.6)	4(26.6)	4(26.6)	4(26.6)
D	1(6.6)	1(6.6)	1(6.6)	1(6.6)	0(0%)

^{a,b,c} Means in the same row with different superscripts differ significantly ($P<0.05$).
* ( ) % of carcass grade.

fed diets containing 50% DLF showed 68.2 kg of carcass weight, which was significantly lower than that of control group (81.9 kg). However, there were no significant differences in carcass weight among DLF-fed groups (P>0.05), probably due to differences in slaughter weights. Dressing percentage of control group was 75.9% while those of DLF-fed groups were 74.6~75.3%. From this result, increasing dietary level of DLF tended to decrease dressing percentage although no significant differences were found (P>0.05). Backfat thickness was 24.7 mm in control group and 20.0~22.1 mm in groups fed diets containing DLF. Increasing dietary level of DLF appeared to decrease backfat thickness although no significant differences were detected (P>0.05). For carcass grade, appearance ratio rated grade B was higher than other grades over all treatment. Feeding leftover food to growing-finishing pigs did not affect meat quality such as dressing percentage, back fat thickness and carcass grade[2,15].

3.2.3 Economic Analysis

The effects of feeding DLF on the economic efficiency in finishing pigs were shown in [Table 7]. Increasing dietary level of DLF decreased feed cost per kg and feed cost required to gain 1 kg of body weight. However, feed cost to gain 1 kg of body weight was lower in groups fed diets containing 25% DLF with 10% higher protein level than that of the other groups. This seemed to be due to higher body weight gain and lower feed intake.

4. SUMMARY

These studies were conducted to investigate the effects of feeding DLF on growth, feed conversion and carcass characteristics of growing and finishing pig. Average daily gain of growing pigs was highest in control group among all the treatment groups except group offered diet containing DLF at 25% with no significant difference. Feed intake of DLF-offered groups were lower than that of control group while feed intake of groups fed diets containing DLF at 50% with 20% higher protein [Table 7]. Effects of Feeding DLF on Economic Efficacy of Finishing Pigs level was significantly higher than that of control group. Feed conversion of growing pigs were not significantly different amont treatments although it seemed to be slightly improved in groups fed diets containing DLF at 25%.

Average daily gain of finishing pigs fed diets containing DLF were significantly lower than that of control group. However, there was no

[Table7] Effects of Feeding DLF on Economic Efficacy of Finishing Pigs

Item	Control	DLF 25%	DLF 50%	AP10+ DLF25%	AP20+ DLF50%
Total feed intake (kg)	115.8	99.4	89.4	100.1	120.3
Feed cost (won/kg)	171.3	155.6	147.5	163.5	157.6
Total feed cost (won)	19,836.5	15,466.6	13,186.5	16,366.4	18,959.3
Total weight gain (kg)	35.2	25.3	20.1	33.8	26.2
Feed cost per kg BW. gain (won)	563.5	611.3	656.0	484.2	723.6

significant differences in average daily gain between groups fed diets containing DLF at 25% with 10% higher protein level and control group. Feed conversion was lowest in groups fed diets containing DLF at 25% with 10% higher protein level. However, there were no significant differences in feed conversion between groups fed diets containing DLF at 25% with 10% higher protein level and control group. Feed conversion of groups fed diets containing DLF at 50% was significantly higher than that of control group. Carcass weight was decreased with increasing levels of DLF in the diets. There were no significant differences in dressing percentage, backfat thickness and carcass grade among treatments.

ACKNOWLEDGMENT

This Study was supported by technology Development Program for Agriculture and Forestry, Ministry of Agriculture and Forestry, Republic of Korea and Samneung Construction Co., LTD., Gwangju, Korea.

REFERENCES

1. Barth, K. M., Vander Noot, G. W., MacGrath, W. S., and Kornegay, E. T. “Nutritive value of garbage as a feed for swine. II. Mineral content and supplementation”, J. Anim. Sci. 25: 52 ~57(1966).
2. Chae, B. J., Choi, S. C., Kim, Y. G., Kim, C. H., and Sohn, K. S. “Effects of feeding dried food waste on growth and nutrient digestibility in growing-finishing pigs”, Asian-Aust. J. Anim. Sci. 13:1304~1308(2000).
3. Derr, D. A., Price, A. T., Sur, J. L., and Higgins, A. J. “Statewide system for recycling food waste”, Biocycle. 29:58~63(1988).
4. Duncan, D. B. “Multiple range and multiple F tests”, Biometric. 11:1(1955).
5. Engel, R. W., Brooks, C. C., Kramer, C. Y., Watson, D. F., and Bell, W. B. “The composition and feeding value of cooked garbage for swine”, Va. Agr. Exp. Sta. Tech. Bul. p 133(1957).
6. Heitman, H. Jr., Perry, C. A. and Gamboa, L. K. “Swine feeding experiments with cooked residental garbage”, J. Anim. Sci. 15:1072~1077(1956).
7. Heitman, H. Jr. and Perry, C. A. “Swine feeding tests”, Calif. Agric. 11(5): 4(1957).
8. Koch, A. R. “The New Jersey Swine Industry - an Economic Analysis”, Min. Rep. N. J. Agric. Exp. Stn. No. Ae 297(1964).
9. Kornegay, E. T., Vander Noot, G. W., MacGrath, W. S., Barth, K. M., Welch, J. G., and Purkhisher, E. D. “Nutritive value of garbage as a feed for swine. I. Chemical composition, digestibility and nitrogen utilization of various types of garbage”, J. Anim. Sci. 24: 319~324 (1965).
10. Kornegay, E. T., Vander Noot, G. W., MacGrath, W. S., and Barth, K. M. “Nutritive value of garbage as a feed for swine. III. Vitamin composition, digestibility and nitrogen utilization of various types”, J. Anim. Sci. 26:1345~1349(1968).
11. Kornegay, E. T., Vander Noot, G. W.,

Barth, K. M., Grabler, G., MacGrath, W. S., Gilberth, R. L., and Bielk, F. J. "Nutritive evaluation of garbage as a feed for swine", N. J. Exp. Bull. No. 829. Reutgers Unit. New Breunswick(1970).

12. Lee, B. S., Cho, S. B., Chung, W. T., and Shin, K. J. "Effects of feeding food wastes as a feed on livestock", Symposium for food wastes as feed. Research Foundation of Food Wastes as Feed. pp 69~80(1998).
13. McClure, K. E., Klosterman, E. W. and Johnson, R. R. "Feeding garbage to cattle and Sheep", Ohio Report on Research and Development in Agriculture. Home Economic and Resources. 55:78~79(1970). Ohio Agric. Res. Dev. Center Wooster.
14. McNaughton, E. P., Ball, R. O. and Friendship, R. M. "The effects of feeding a chocolate product on growth performance and meat quality of finishing swine", Can. J. Anim. Sci. 77: 1~8(1997).
15. Myer, R. O., Brendemuhl, J. H. and Johnson, D. "Evaluation of dehydrated restaurant food waste products and feedstuffs for finishing pig", J. Anim. Sci. 77:685~692(1999).
16. Nam, B. S., Chung, I. B., Kim, Y. H., Moon, H. K., Kim, D. H., Hur, S. M., Bae, I. H., and Yang, C. J. "Effect of recycled food waste on the growth performance and carcass characteristics in growing-finishing pigs", J. Anim. Sci. & Technol.(Kor.). 42:279~288(2000).
17. NRC. "Nutrient requirement of swine". 10th. National Academy Press. Washington, DC.(1998).
18. Pond, W. G. and Maner, J. H. "Swine production and nutrition", Chapter 11. AVI Publishing Company, Inc., Westport, Conn. pp 336~368(1984).
19. SAS. "SAS User's Guide Statistics", Statistical Analysis System. Inst.(1995).
20. Sebek, L. B. J., Smths, B. and Koorn, T. "Ensiled domestic food waste : Nutritive value and use for fattening pigs", Report Instituut voor Veevoedingsonderzoek. No. 218. p 34(1990).
21. Westendorf, M. L., Zirkel, E. W. and Gordon, R. "Feeding food or table waste to livestock", The Professional Anim. Scientist. 12:129~137(1996).
22. Westendorf, M. L., Dong, Z. C. and Schoknecht, P. A. "Recycled cafeteria food waste as a feed for swine: Nutrient content, digestibility, growth, and meat quality", J. Anim. Sci. 76: 2976~2983(1998).