EEEFECTS OF FEEDING ILLITE AND LOESS ON CARCASS AND MEAT QUALITY CHARACTERISTICS IN FINISHING PIGS

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Abstract – This study was conducted to investigate the effects of illite and loess supplementation on carcass and meat quality characteristics of finishing pigs. A total of 60 pigs were used to 6 groups with 3 replications. Carcass weight was higher in the T3, T4, T5 and T6 groups compared to the T1 ($p<0.05$). In the backfat thickness, T5 group showed significantly higher level compared to the T1 ($p<0.05$). In the chemical composition of *longissimus* muscle, T1 group was the highest in moisture, and lower in protein and fat contents than those of the other groups ($p<0.05$). In the meat quality, there were no significant differences in pH, WHC (Water holding capacity), drip loss, cooking loss and shear force values among the groups. The marbling score was increased by the supplementation of illite and loess compared to that of T1. In the meat color, there were no significant differences in L^* (Lightness) and a* (redness) values, but, the b^* (Yellowness) value was higher in T3, T4, T5 and T6 compared to T1 ($p<0.05$). As a result, it was determined that information about carcass characteristics and meat quality from finishing figs will be helpful to use as a natural additives on pig diet.

Key Words – Illite, Loess, Carcass characteristics, Meat quality

I. INTRODUCTION

Illite is a typical clay material that consists of Al^{3+}, Mg^{2+}, the octahedral cation Li and K, Na and Rb. It is known to emit far-infrared radiation and absorb toxic gases. Loess contains SiO^2, Al^2O^3, Fe^2O^3, MgO, K^2O, Na^2O which possesses various physicochemical properties depending on the original rock type and the extent of weathering. The physicochemical properties of loess show diversity in fine particulate, plasticity, ion exchange, and adsorption properties due to the influence of clay minerals (Hwang, 1997).

Illite supplementation in the diets of broilers has been reported to prevent diarrhea and enhance digestibility of feed (Kurnick and Reid, 1960). On the hand, illite supplementation in pigs has effectively reduced the incidence of diarrhea, disease prevalence, and mortality, and increased body weight and feed efficiency (Kondo and Wagai, 1968). Supplementation of loess and illite in finishing pigs improved body weight gain and feed conversion ratio (FCR) (Ha *et al*., 2001). However, studies on the effects of illite and loess supplementation on carcass characteristics and meat quality are severely lacking. Therefore, the objective of this study was to investigate the effects of illite and loess supplementation on carcass characteristics and meat quality of finishing pigs.

II. MATERIALS AND METHODS

Sixty, three-way cross hybrid growing pigs (LYD) were selected from the progeny of a Landrace and Yorkshire (LY) F1 sow and a Duroc (D) boar. Illite and loess were provided as powdered feed additives by Woosung Feed Company Ltd. The feeding experiments were conducted at the experimental pigpen (T1: basal diet for total period, T2: early growth 0.8% illite + late growth 0.5% illite, T3: early growth 0.8% illite + late growth 1.0% illite, T4: early growth 0.8% illite + late growth 1.5% illite, T5: early growth 0.8% illite + late growth 2.0% illite, T6: early growth 0.8% loess + late growth 1.5% loess) at Woosung Feed Company from July to November 2007. The *longissimus* muscle between the 6th and 12th rib on the left side of the carcass was resected 24 h after slaughter for carcass characteristics and meat quality traits(moisture, crude protein, intramuscular fat, crude ash, pH-24 hr, water holding capacity, drip loss, cooking loss, shear force,

marbling, pork characteristics and meat color) analyses at Chungbuk National University.

III. RESULTS AND DISCUSSION

The carcass characteristics of finishing pigs fed of illite and loess-supplemented diets are presented in Table 1. Compared to the T1 group, carcass weight and backfat thickness were all increased in the illite and loess supplementation groups ($p<0.05$). On the other hand, there were no significant differences in the live weight and carcass length. According to Ha *et al*. (2001), supplementation of illite in the feed of growing and finishing pigs increased carcass weight. The illite (T4) and loess (T6) supplementation improved the grade A frequency.

Table 1. Effects of dietary illite and loess supplementation on carcass characteristics of finishing pigs

Treatments*		T1	T2	T3	T4	T5	T6
Live weight (kg)		101.70 ±13.52	106.67 ±6.89	107.50 ±5.34	107.56 ±7.04	106.78 ±6.22	111.10 ±6.37
Carcass weight (kg)		65.60 ±8.44^{b}	69.50 ±4.70^{ab}	71.40 ±3.37^{a}	71.44 ±7.47^{a}	73.11 ±5.21^{a}	74.60 ±3.57^{a}
Backfat thickness (㎜)		10.20 ±3.16^{c}	13.30 ±1.83^{ab}	13.10 ±3.54^{ab}	15.00 ±3.20^{ab}	16.22 ±2.49^{a}	15.20 ±3.43^{ab}
Carcass length (㎝)		81.90 ±2.47	80.70 ±2.71	82.00 ±2.45	81.00 ±2.69	80.67 ±3.04	82.00 ±1.76
Carcass grade (head)	A	1	2	6	7	5	7
	B	4	8	2	2	3	3
	C	1	-	1	-	1	-
	D	4	-	1	1	-	-

*T1: basal diet for total period, T2: early growth 0.8% illite + late growth 0.5% illite, T3: early growth 0.8% illite + late growth 1.0% illite, T4: early growth 0.8% illite + late growth 1.5% illite, T5: early growth 0.8% illite + late growth 2.0% illite, T6: early growth 0.8% loess + late growth 1.5% loess.

[a-c]Means±SD with different superscripts in the same row differ significantly ($p < 0.05$).

The chemical composition of the *longissimus* muscle of finishing pigs supplemented with illite and loess is presented in Table 2. Compared to the T1 group, the protein and fat contents in the illite and loess supplementation groups were higher. These results are consistent with a report by Kang *et al*. (2001), in which clay mineral fed to growing-fattening Hanwoo cattle reduced the moisture content and increased the fat content of beef. In contrast, a study by Kim *et al*. (2007) who reported that feeding illite to growing and finishing pigs did not affect any significant change in the chemical composition of pork.

Table 2. Effects of dietary illite and loess supplementation on chemical composition of *longissimus* muscle from finishing pigs (%)

Treatments*	T1	T2	T3	T4	T5	T6
Moisture	77.78 ±1.07^{a}	73.66 ±3.09^{b}	74.47 ±0.34^{b}	74.75 ±1.00^{b}	75.33 ±3.75^{b}	74.70 ±0.53^{b}
Protein	19.90 ±0.87^{b}	23.27 ±2.72^{a}	22.43 ±0.32^{a}	21.64 ±1.52^{ab}	21.50 ±3.34^{ab}	22.42 ±0.35^{a}
Fat	1.16 ±0.28^{b}	1.89 ±0.39^{a}	2.98 ±0.48^{a}	2.46 ±1.38^{a}	2.08 ±0.54^{a}	1.79 ±0.31^{a}
Ash	1.16 ±0.21	1.18 ±0.16	1.13 ±0.15	1.15 ±0.13	1.09 ±0.20	1.08 ±0.08

*Treatments are same as below Table 1.

[a-b]Means±SD with different superscripts in the same row differ significantly ($p < 0.05$).

The meat quality characteristics of finishing pigs supplemented with illite and loess is presented in Table 3. All pH values of *longissimus* muscle were ranged at 5.49-5.58. The water holding capacity values of groups with illite and loess were not significantly different with T1. The drip loss and cooking loss in the illite and loess supplementation groups were lower than the T1 group. In addition, the meat of the illite and loess supplemented groups (T3, T4, and T6) was tender, because the shear force was lower than the others. The marbling and pork characteristic scores were also superior in the groups with illite and loess. The loess supplementation group showed superior meat quality in comparison to the T1 group and its results were similar to those of the illite supplementation groups (T3 and T4). In the meat color, the lightness and redness values were not significantly influenced by the illite and loess, however, the yellowness value was increased by the addition of illite and loess in the treatment groups ($p<0.05$).

IV. CONCLUSION

Based on the studied results, illite and loess supplementation improved the carcass and meat quality characteristics of finishing pigs. While 1.5% is the optimal feeding level, 1.0% is also beneficial

and recommended. Feeding loess generally showed similar results to the 1.0% illite supplementation group in terms of carcass characteristics and meat quality. Therefore, feeding illite and loess improves carcass characteristics and meat quality of finishing pigs, which justifies its potential use in the production of high quality pork.

Table 3. Effects of dietary illite and loess supplementation on meat quality characteristics of *longissimus* muscle from finishing pigs

Treatments*	T1	T2	T3	T4	T5	T6
pH	5.58 ±0.08	5.53 ±0.12	5.47 ±0.06	5.53 ±0.17	5.51 ±0.09	5.49 ±0.05
WHC (%)	65.41 ±3.76	65.60 ±3.82	65.41 ±4.38	66.02 ±3.25	65.61 ±4.37	65.46 ±3.44
Drip loss (%)	4.92 ±0.65	4.36 ±0.74	4.66 ±0.84	4.57 ±1.37	4.52 ±0.77	4.53 ±0.89
Cooking loss (%)	32.28 ±1.39	29.93 ±2.45	30.03 ±1.81	31.73 ±2.86	30.97 ±2.41	30.31 ±1.95
Shear force (kg)	1.61 ±0.31	1.71 ±0.40	1.48 ±0.30	1.43 ±0.25	1.75 ±0.45	1.50 ±0.37
Marbling	1.48 ±0.29	2.23 ±0.61	2.07 ±0.66	1.80 ±0.56	1.98 ±0.63	1.84 ±0.38
Pork characteristics	2.66 ±0.25	2.82 ±0.33	2.64 ±0.33	2.58 ±0.30	2.72 ±0.14	2.68 ±0.28
L**	59.82 ±2.86	56.93 ±2.94	58.26 ±2.71	58.32 ±2.89	58.38 ±2.07	58.74 ±2.86
a**	5.27 ±0.79	4.88 ±1.14	5.76 ±1.27	5.42 ±1.66	4.76 ±0.76	5.68 ±1.43
B**	6.86 ±0.69^{b}	7.42 ±0.74^{ab}	7.79 ±0.85^{a}	7.82 ±0.66^{a}	7.89 ±0.69^{a}	8.13 ±1.12^{a}

*Treatments are same as below Table 1.
$^{a-b}$Means±SD with different superscripts in the same row differ significantly ($p < 0.05$).
**L: lightness, a: redness, b: yellowness

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