

## 한국형 한협 육계의 행동 특성과 성장성에 미치는 Litter Type과 Gender의 영향

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### Effects of Litter Type and Gender on Behavior Characteristics and Growth Performance of Korean Hanhyup Broiler

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**ABSTRACT** The Korean Hanhyup broiler has commercialized native meat-type chicken. This study aimed to determine the effects of two types of litter material- sawdust and rice husk, and gender on the Korean Hanhyup broiler. Chicks (n=416) were randomly assigned in a 2 × 2 factorial design by type of litter material and gender. The behavior of chicken's was monitored continuously for 12 hours during the 1<sup>st</sup> through 8<sup>th</sup> week of age. The time spent on standing, sitting, and walking and the frequency of drinking, feeding, preening, dust bathing, flapping, and aggressive pecking, and pecking of chicken's behavior were recorded. The behavior of chickens during the starter (1 to 4 weeks) and finisher period (5 to 8 weeks) was compared to observe the changes upon maturity.

Our results indicate that litter material type and gender have no effect on the behavior of chickens. However, aggressive pecking and pecking caused increment in the rice husk as compared to sawdust ( $P<0.05$ ). Sawdust as litter material for bedding was found to be better than rice husk with respect to Korean Hanhyup broiler behavior.

(Key words: broiler, Korean Hanhyup, litter materials, behavior, welfare)

## INTRODUCTION

Behavior is the best form of welfare evaluation for poultry (Duncan, 1988). Farm animals should be analyzed using behavioral approach based on cognitive psychology (Desire et al., 2002). Chicken behavior includes dust bathing and feeding on litters. The type of litter is used for determining whether chicks have been contaminated by feces and if the temperature and humidity are kept. Litters must be laid in sufficient depth with a suitable type and size. Types of litter

such as feather and litter of broiler are mixed with droppings, which affects quality of health, quality of meat, and welfare (Mayne et al., 2007).

Contaminated type of litter can affect the growth rate and the quality of carcass (Bilgili et al., 2009) due to health problems including bacteria in broiler affecting body weight and immune system (Toghyani et al., 2010). In addition, when chickens are come into contact with poor litter materials while standing or sitting, this can induce skin tumor on the chest area, soles of feet, and hock joints (Arogo et al.,

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2006).

Physiological studies on the type of litter (Atapattu et al., 2008; Torok et al., 2009) and behavioral studies (Toghyani et al., 2010) have been made, but we have few studies on Korean Hanhyup broiler. Therefore, the objective of this study was to determine the effects of two types of litter material - sawdust and rice husks and gender on the behavior characteristics and growth performance of the Korean Hanhyup broiler.

## MATERIALS AND METHODS

### 1. Animals, Experimental Design, Feeding and Management

For this experiment, we raised 10-day-old chicks (n=416) for Korean Hanhyup broiler (HANHYUP No.3). The chicks were separated into 4 different pens. Twenty-five male and 28 female chicks were put on 2 pens of sawdust, and 2 pens

of rice husks. Chicks were randomly assigned in a  $2 \times 2$  factorial experiment and 4 treatment combination by type of litter and gender. All the walls of each pen were solid and 0.7 m high. Each pen had an overhead brooder and a circular free. The feeding trial started at d 10 and finished at d 70 of age for 60 days. The temperature and relative humidity were kept at 30°C and 50%, respectively. According to the feeding standards (NIAS; National Institute of Animal Science, 2007) flocks were given a free access to the feed. For an 8-week period, chickens were kept under 16 hours of light per day (16L: 8D).

### 2. Behavioral Observations

We recorded behaviors for 12 consecutive hours from the 1<sup>st</sup> to the 8<sup>th</sup> weeks of age. To examine the Korean HANHYUP broiler's behavior, we evaluated the time spent for standing, sitting, and walking and the frequency of drinking, feeding, preening, dust bathing, flapping, aggressive

**Table 1.** Behavioral classification of Korean Hanhyup broiler

Item	Definition
Measure of one zero (time budget)	
Standing	To assume or maintain an upright position on extended legs. The behavior patterns involved in standing up show a high degree of uniformity within species, but may be modified by environmental circumstances.
Sitting	Body position in which the posterior of the body trunk is in contact with the ground and supports most of the body weight.
Walking	Relatively low speed locomotion of an organism on the ground in which propulsive force derives from the action of legs.
Measure of instantaneous sampling (count)	
Drinking	Voluntary oral ingestion of liquids.
Feeding	Delivery of feed to animals in feedbox.
Preening	An act of integumentary care in birds similar in function to grooming in mammals. Preening is manifested as manipulation of feathers and distribution of secretions from the uropygial gland using the beak, and also as scratching of the body surface with claws or beak.
Dust bathing	A behavior pattern that is a component of integumentary care characterized by lying on the side and making a small depression in the floor surface while head rubbing, bill raking, wing shaking, and scratching on the floor.
Pecking	Pecking is performed with a short, quick forward motion of the head and is displayed during investigation following visual inspection, during feeding, during fighting, and during courtship.
Flapping	Rapid rotatory oscillation of the wings flap and strike against the body.
Aggressive pecking	A term occasionally used to refer to unreciprocated pecks directed towards group peers. Aggressive pecking is assumed to be a sign of rigid social dominance or despotism.

pecking, and pecking (Table 1). Overhead camera generated the top view of poultry. The top-view camera was placed at the height of 1.7 m, above the center of each pen. The CCTV camera captured the behavior images (IR LED Camera; APD-7070V, Sony, Fig. 1).

Two methods of time sampling were involved with measuring what is happening at particular moments (instantaneous sampling) or recording whether or not a given event has occurred within a given period (one zero) (Martin et al., 2007). chicken's behavior during the starter (1 to 4 weeks) and the finisher (5 to 8 weeks) periods was compared to see the changes in each behavior as the chickens matured.

### 3. Statistical Analysis

Our analysis was performed with SAS software (SAS, 2003) for independent sample *T*-test. Significant difference ( $P<0.05$ ) was used to analyze the difference between types of litter (sawdust and rice husks) and gender (male and female). The probability value of 0.05 was considered as significant.

## RESULT AND DISCUSSION

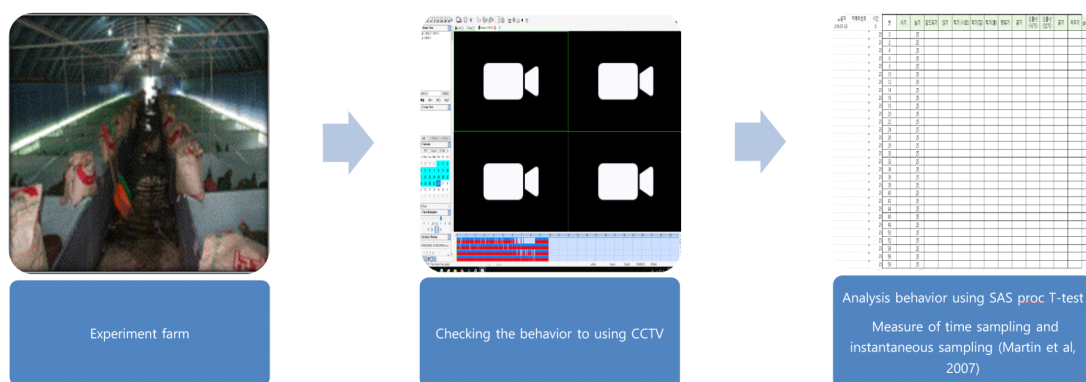
### 1. Effects of Type of Litter and Gender on Behavior

Table 2 and 3 are the summaries on the effects of types of litter and gender on behavior. The percentage of standing time was shown similarly in both early and late periods. In type of litter, males were analyzed to be higher in rice husks than the other, whereas females higher in sawdust than the

other. In contrast to the standing behavior, sitting time appeared higher in sawdust than in males, whereas appeared higher in rice husks than in females. Sitting time means rest and inactivity, but the types of litter coming into contact with skin can cause disease in the parts of body being in contact with litter and this was worsened as a result of prolonged sitting time and indicates a low level of welfare (Shields et al., 2004).

In the early and late part of behavior (drinking, feeding, preening, dust bathing, and pecking flapping), there was no gender difference, but sawdust appeared higher than the rice husks in the effects of type of litter (Table 2 and 3). This was consistent with the findings reported by Song (1996) that the feeding behavior of males are 4 to 5 times faster than that of the females who spent longer time in feeding in one day. Feed efficiency and feed ratio were higher in males than in females (Marks, 1985). Most of the poultry rested after preening behavior. Preening behavior, which is a part of grooming behavior can be motivated by internal and external stimuli to maintain the body surface (Vezzoli et al., 2015). Therefore, in this experiment, the preening and dust bathing behaviors, which are a kind of resting behaviors are higher in sawdust than in rice husks.

Aggressive pecking and pecking occurred incrementally in the 'rice husks' pens compared to the 'sawdust' pens ( $P<0.05$ , Table 2). Much time was spent in walking in the 'rice husks' pens, but for some broilers, more sitting hour meant higher aggressive pecking behavior, which appeared more frequent in rice husks. Broilers increasingly performed



**Fig. 1.** Analysis progress.

**Table 2.** Effect of litter types and gender on behavioral using method of one zero (time budget) and instantaneous sampling (count) in the former period (1~4 week)

Gender	Male		Female		SEM	<i>P</i> -value		
Litter type	Sawdust	Rice husks	Sawdust	Rice husks		Gender	Litter	Gender × Litter
Time (minutes)								
Standing	227.95	281.95	283.25	277.25	3.74	0.601	0.119	0.968
Sitting	377.58	363.52	362.14	378.35	4.95	0.363	0.211	0.071
Walking	64.47	74.54	74.61	64.41	1.75	0.917	0.413	0.218
Count (number)								
Drinking	23.12	22.36	27.98	18.51	0.56	0.942	0.842	0.591
Feeding	56.36	53.88	57.31	52.81	2.03	0.157	0.478	0.393
Preening	58.29	53.41	57.07	53.62	2.56	0.515	0.622	0.814
Dust bathing	5.22	4.53	6.57	3.17	0.44	0.830	0.099	0.654
Pecking	33.65	29.49	35.58	27.59	1.50	0.693	0.871	0.121
Flapping	83.55	79.97	88.96	75.01	1.51	0.468	0.317	0.935
Aggressive pecking	7.01	7.89	5.63	9.26	0.28	0.188	<0.05	0.168

SEM, Standard error of mean.

**Table 3.** Effect of litter types and gender on behavioral using method of one zero (time budget) and instantaneous sampling (count) in the later period (5~8 week)

Gender	Male		Female		SEM	P-value		
Litter type	Sawdust	Rice husks	Sawdust	Rice husks		Gender	Litter	Gender × Litter
Time (minutes)								
Standing	279.05	287.12	301.95	284.44	4.48	0.119	0.221	0.592
Sitting	350.1	345.32	327.30	367.67	4.12	0.323	0.966	0.842
Walking	90.85	87.57	90.75	87.94	1.74	0.601	0.842	0.968
Count (number)								
Drinking	21.08	19.75	22.86	17.98	0.91	0.218	0.089	0.071
Feeding	51.24	48.92	50.94	49.22	0.94	0.323	0.148	0.668
Preening	74.18	73.15	78.04	72.31	2.17	0.211	0.842	0.473
Dust bathing	3.52	2.35	3.99	1.88	0.29	0.490	0.285	0.992
Pecking	29.64	26.74	28.67	24.79	1.02	0.337	0.653	0.178
Flapping	86.60	84.25	91.38	79.09	2.64	0.198	0.131	0.146
Aggressive pecking	6.76	7.66	7.61	6.81	0.21	0.109	0.505	0.343

SEM, Standard error of mean.

many of their behaviors on the sand, but if only one type of litter was provided, they would perform those behaviors at a

similar frequency on the sand or wood shavings (Song, 1996; Shields et al., 2004). Aggressive behavior means any pur-

positive action of organism toward another with the actual or potential result of harming, limiting, or depriving it (Hurnik et al., 1995). So the aggressive behavior appeared higher in males.

Therefore, the welfare showed an improvement in the ‘sawdust’ pens because active behavior was more compared to the ‘rice husks’ pens.

## 2. Effects of Litter Types and Gender on Growth Performance

Weight gain (WG) in started during d10-25 was observed to be higher in rice husks than in sawdust ( $P<0.05$ , Table 4). WG during d26-40 and d56-70 appeared higher in sawdust than rice husks ( $P>0.05$ ). WG in total tended to increase in sawdust higher than in rice husks ( $P<0.05$ ). The effects of gender on weight gain (Table 4) appeared during d 10~25 and the overall weight gain was higher in males than in females ( $P<0.05$ ). According to Huang et al. (2009), at difference between rice husks and sawdust litter with the increased weight gain when using rice husks in the body weight gain differences. This was inconsistent with the results of our experiment. It is determined as a result of the difference in the characteristics between broilers and Korean Hanhyup broiler.

## CONCLUSIONS

The authors conclude that welfare behavior (aggressive behavior) in sawdust was higher than rice husks. Therefore, sawdust is preferable for Korean HANHYUP broiler. From

the results of this study, we conclude that welfare in broiler production is determined by the environment and considerations of gender and litter management. It would be necessary to perform the further researches in order to address the other possible aspects of the effects of type of litter on chickens.

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**Table 4.** Effect of litter type and gender on growth performance of Korean Hanhyup broiler

Gender	Male		Female		SEM	P-value		
Litter type	Sawdust	Rice husks	Sawdust	Rice husks		Gender	Litter	Gender × Litter
Weight gain (g/bird)								
d 10~25	372.71	389.07	343.91	354.31	21.43	0.0001	0.0139	0.5636
d 26~40	336.76	329.87	330.21	324.98	17.60	0.6399	0.6204	0.9457
d 41~55	1,048.43	1,046.67	834.87	788.96	38.54	0.0001	0.1671	0.1997
d 56~70	749.97	684.75	567.57	576.43	87.63	0.0001	0.2179	0.1087
Overall	2,507.88	2,450.38	2,076.56	2,044.71	103.87	0.0001	0.0498	0.5608

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