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Behavior of laying hens in relation to housing system and stain

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Abstract

The current study was to investigate the effect of different enriched cages and lohmann strains in behavior of layers. A total of 480 layers of lohmann breed, at 30 weeks old (240 lohmann brown "LB" & 240 lohmann selected leghorn "LSL") were reared in 2 types of enriched cages "Salmet & Big dutchman". The results revealed that the most of normal behaviors were significantly higher in salmet system, while nesting and other abnormal behaviors "feather pecking" were significantly higher in big dutchman. All normal behaviors in the present study were higher in LSL with significant difference in eating, preening, nesting and resting behavior. Neverthless, abnormal behaviors were significantly higher in LB. In conclusion, good selection of cage system and strain of layers play role in improvement normal behavior and control of abnormal behavior.

Key Word: Layer, Enriched cage, Strain, Behavior

Introduction

There are many factors which can decrease the performance and increase abnormal behaviours of hens such as diseases, management and housing. The conditions under which laying hens are kept remain major animal welfare concern. Housing system has a significant effect on the welfare of laying hens, and one of the factors for estimating the welfare is the condition of feathers[13]. Cage system is one of the housing system and widely used for laying hens because egg production is cheaper in cages than in alternative husbandry system. It has three different categories: non-enriched cages, alternative systems and enriched cages. Non-enriched cages mean the common battery cages, alternative systems refer to non-cage system such as aviaries. While the enriched (modified) cages aim to improve hen welfare by providing with perches, nest boxes, sand bath mates and other facilities. And the major criticisms of the cage systems are that they increase the incidence of feather damage, overgrowing claws, foot lesions and brittle bones[22]. The presence of apparently purposeless behavior, of high levels of aggression or redirected behaviours such as feather pecking and cannibalism are indicators that the housing system is not meeting the behavioural needs of the hens and hence is not satisfactory for bird welfare[26]. To overcome this problem, overseas research has increasingly turned toward improving the welfare of birds in cages by modifying cage design[7]. Selective breeding for desired traits such as decreased feather pecking and cannibalism may help to improve welfare[12]. The causes of variation in productivity, mortality rate and cannibalism rate revealed a strong effect of strain[1]. The differences in cannibalistic and feather pecking behavior between brown and white eggs layers[17]. The aim of the current study was to investigate

the effect of different enriched cages and lohmann strains in behavior of layers.

Materials and Methods

This experiment was performed on 480 layers of lohmann breed, at 30 weeks old and divided into 240 Lohmann brown (LB) and 240 Lohmann selected Leghorn (LSL). Each strain was reared in 2 types of enriched cages (salmet and big dutchment) with floor area of 900 cm^2 for each bird and housed at the farm in the Faculty of Veterinary Medicine, Zagazig University, Egypt. Description of enriched cages was in Table (1). During the experimental period, a 14- hour lighting schedule was applied from fluorescent light. Feed and water were provided ad libitum. The basal layer diet was fed containing 18% of crude protein and 3000 Kcal/Kg of metabolized energy[16]. Direct observations were conducted to record different behavior through scan sampling method by the same person[14]. The observer stood directly in front of the pen and waited ten minutes before recording to avoid any disturbance in the behavior. All cages were observed directly for 2 × 10 minutes in the morning and for 2 × 10 minutes in the afternoon on two days every week[11]. After scanning, the numbers of birds were counted & calculated the frequencies of activities[15]. Behavioral patterns, as percentages were:

- Eating, drinking, preening, perching, nesting, resting and dust bathing.
- Resting behavior: sitting to remain dormant with the neck withdrawn[18].
- Dust bathing: side-rubbing, head-rubbing & wing shaking with scratching[23].
- Feather pecking (Fp): only pecks to feathered parts of the body[3].
- Aggressive behavior (Ag): the birds counter acts toward other birds.

Data was statistically analyzed by SAS statistical system[19]. One-factorial analysis of variance (ANOVA) was performed. Differences between means were tested by Student's t-test.

Table 1. Description of systems and birds per cage.

	Big dutchman (BD)	Salmet (S)
No. of birds in cage	60	30
No. of cage	4	8
Cage s pace	360 cm * 155 cm	400 cm * 70 cm
No. of nest	2	2
Nest space	90 cm * 30 cm	54.5 cm * 25 cm
No. of upper perch	2	1
Length of upper perch	175 cm	200 cm
No. of lower perch	2	5
Length of lower perch	175 cm	75 cm
No. of middle perch	1	0
Length of midd le perch	175 cm	------
No. of bath -mate	2	4
Bath-mate space	75 cm * 30 cm	35 cm * 20 cm
Area of trough / bird (cm^2)	12 cm^2	12cm^2
No. of drinking nipples	8	7

Results

Significance levels of main factors and their interaction for different behavior were shown in Table 2. It clearly showed that system of housing and strains of lohmann had significant effect on most of behavioral patterns. While, the interaction between system and strain didn't affect in the most of behavioral patterns except dust bathing. Means ± standard deviation of normal behaviour were presented in Table 3. It clearly revealed that these behaviors were significantly affected by housing system and strains of lohmann breed. Moreover, housing system and strains of lohmann breed had significant effect on abnormal behavior (Table 4).

Table 2. Significance levels of main factors & their interaction on behaviors of layers.

Sources of variance	Eating	Drinking	Preening	perching	Nesting	Resting	Dustbathing	Fp	Ag
System (S)	NS	***	***	**	*	***	***	*	NS
Breed (B)	*	NS	***	NS	***	***	NS	***	**
S*B	NS	NS	NS	NS	NS	NS	***	NS	NS

P< 0.05; ** P< 0.01; *** P< 0.001; NS, not significant; Fp, feather pecking; Ag, aggression.

Table 3. Means (± SD) of behavioral traits of hens in response to lohmann strains and housing systems (% of hens in observation period).

Behavior		Big Dutchmen	Salmet	Means
Eating	**LB**	19.75±11.42	22.10±14.14	20.92±12.86 [b]
	LSL	30.15±12.03	32.6±14.95	31.38±13.57 [a]
	Means	24.98±12.81	27.32±15.42	
Drinking	**LB**	4.87±5.79	6.9±2.98	5.89±4.70
	LSL	6.38±7.53	7.22±3.30	6.8±5.79
	Means	5.61±6.72 [b]	7.07±3.14 [a]	
Preening	**LB**	0.48±1.04	6.27±368	3.37±3.96 [b]
	LSL	1.03±1.86	13.55±8.28	7.29±8.64 [a]
	Means	0.75±1.57 [b]	9.91±7.31 [a]	
Perching	**LB**	7.2±3.77	12.43±4.14	9.82±4.74
	LSL	8.55±6.12	13.95±5.51	11.25±6.39
	Means	7.89±5.13 [b]	13.17±4.90 [a]	
Nesting	**LB**	3.58±2.40	2.75±3.23	3.16±2.87 [b]
	LSL	6.29±4.34	5.10±4.95	5.69±4.69 [a]
	Means	4.95±3.74 [a]	3.91±4.34 [b]	
Resting	**LB**	1.67±2.08	3.14±2.79	2.4±2.56 [b]
	LSL	6.95±7.42	10.37±8.99	8.66±8.39 [a]
	Means	4.33±6.05 [b]	6.74±7.55 [a]	
Dust bathing	**LB**	1.84±2.60 [b]	2.26±3.64 [ab]	2.05±3.16
	LSL	1.53±1.84 [b]	3.47±4.93 [a]	2.5±3.88
	Means	1.63±2.27 [b]	2.97±4.37 [a]	

*Means within same column with different letters are significantly different (P≤0.05).

Table 4. Means (± SD) of abnormal behavior of layers in response to lohmann strains and housing systems (% of hens in observation period).

Behavior		Big Dutchmen	Salmet	Means
Feather pecking	LB	7.32±7.96	4.94±6.57	6.13±7.38[a]
	LSL	5.43±3.80	2.48±3.12	3.96±3.77[b]
	Means	6.40±6.29[a]	3.69±5.26[b]	
Aggression	LB	0.18±0.49	0.13±0.49	0.15±0.49[a]
	LSL	0.09±0.36	0.07±0.35	0.08±0.37[b]
	Means	0.13±0.44	0.10±0.43	

*Means within same column with different letters are significantly different ($P \leq 0.05$).

Discussion

In practice, behavioural measures are often the starting point for assessing an animal's response to its environment and hence, its welfare. The notion is that welfare assessment can provide insights into important factors when designing environments for chickens[8]. Behavior is a good indicator for the assessment of the well-being of laying hens. The data in the present study showed that eating behavior was significantly higher in salmet than big dutchman, while there was no significant difference between LSL and LB. % drinking was significantly lower in big dutchman than salmet cages. The differences in ingestive behavior (eating and drinking) under different housing system may be due to change in group size and its relation to social hierarchy.

Also, LSL had the increase in eating and drinking behaviors with significant deference in eating behavior. These results refer the effect of strain on feed intake, however the time spent eating was not affected by strains (brown-egg layers and white-egg layers), as mentioned before[20]. While white hens spent the most time in drinking and brown hens spent the least. In other study the appetitive was not significantly affected by strain[2].

The type of housing had a significant effect on preening behaviour of bird[8], where it was significantly higher in salmet than big dutchman. According to strain, LSL appears the increase of preening behaviour and this was evident in our study.

Perching the layers in salmet system was the highest with significant difference. This result may be due to the space allowance of perch/hen in salmet was higher than big dutchman[6]. The same observation for perching behavior was described by previous publication before[4,9,21]. And, it was higher in LSL than LB, but the difference didn't reach the significance. Number of hens in nest was significantly higher in big dutchman than salmet cages. However, it was increased significantly in LSL than LB, as mentioned by. This result was in agreement with the results reported before[10,24]. Dust bathing and resting behaviors were the highest in salmet system with significant differences. Also, it was higher in LSL than LB with significant difference in resting behaviour. There was no significant effects of strains on dust bathing[20], while, Hy-Line Brown layers performed more dust bathing than Hy-Line White[25]. There was significant increase of resting behavior in LSL in compare to LB [10]. Regarding the influence of cage system on abnormal behavior, the results of Table (4) showed increase in big dutchman with significant difference in feather pecking. These results may be attributed to increase group size in big Dutchman, as mentioned before[5]. In conclusion, good selection of cage system and strain of layers play role in improvement normal behaviour and control of abnormal behaviours especially aggressive pecking.

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