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# COMPARE THE PERFORMANCE AND EGG QUALITY OF TWO STRAINS OF LAYING HENS HOUSED IN FURNISHED CAGES

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***Abstract***

*This study was carried out to compare indices of production and egg quality of two strains of laying hens (Lohmann Brown and Atak-S) housed in furnished cages. Lohmann Brown (LB) and Atak-S (AS) hens were housed in furnished cages (n= 700; 14 cages; 25 hens per cage; floor space 600 cm2/hen) from18 to 50 wk. Furnished cages included nests, perches and sandbathes. The hen day egg production, feed intake and egg weight of LB hens were higher than AS hens at week 40 and 50 (P<0.05). The AS had a significantly higher body weight (2074.1 g and 1900.2 g respectively) and lower mortality rate (7.1% and 12.7 % respectively); than LB hen at week 50 (P<0.05). However, no significant differences on egg quality parameters were noticed between LB and AS hens throughout the experiment (P > 0.05). In conclusion, our results showed that strain selection is important for productivity of laying hens rearing in furnished cages. Furthermore it can be concluded that performance of LB hens was better than AS hens in furnished cages.*

***Key words****: egg production, laying hens, furnished cages, Lohmann Brown, Atak-S.*

## INTRODUCTION

Egg production system is probably one of the most important challenges for the egg producing industry in the last decade. There are various factors including diseases, behavior, nutritional value, genetics and air conditions in house affecting the level of welfare laying hens (Denli et al., 2016).

Housing in the cage is the most common system for growing of laying hens. Conventional cages have some welfare advantages particularly that they keep hens in small groups and hygienic conditions (Appleby et al., 2002).

Because of some disadvantages of conventional cages system on animal welfare and other problems various alternative housing systems have been carried out to minimize these negative effects.

Aviaries, free-range and enriched cage systems are in the acceptable alternative systems with regard to alleviate the problems of conventional cage systems.

Recently furnished (enriched) cage rearing system has been received a great attention as an alternative housing systems for laying hens after the ban decision on conventional cages in the European Union by 2012 (CEC, 1999). Laying hen's performance and production parameters such as egg weight, feed efficiency, daily feed consumption, and mortality may be influenced by the different housing systems (Taylor and Hurnik, 1996; Batkowska et al., 2014), genotype and age (Zita et al., 2009) and environmental conditions (Hester et al., 2005). Moreover, egg quality may also be affected by the housing systems (Vits et al., 2005) as well as the age of the laying hens (Silversides et al., 2006).

Up to now, the production performance and egg quality characteristics of many laying hens strains in different housing systems have been compared (Abrahamsson and Tauson, 1997; Van Den Brand et al, 2004; Mallet et al, 2006). Atak-S (AS) is a Turkish domestic egg laying strain has been developed by Ankara Poultry Research Institute in 2004 (Goger et al, 2016) and because of many reasons AS strains is preferred by farmers.

However, there is no enough knowledge on the performance of Atak-S (AS) strain in different housing systems. Therefore, the aim of the current study was to determine and compare indices of production and egg quality parameters of two strains of laying hens (Lohmann Brown and Atak-S) housed in furnished cages.

## MATERIALS AND METHODS

A totally seven hundred 18-wk-old Lohmann Brown and Atak-S hens were housed in furnished cages (n= 700; 14 cages; 25 hens per cage; floor space 600 $cm^2$/hen) to 50 week of age. The furnished cages (120 x 55 x 45; length × width × height; floor space 600 $cm^2$/hen) had wire floors and solid metal walls. Hens were fed the same diet formulated was based on National Research Council (NRC) (1994) containing 17.5 % CP, 2800 ME/kg, 3.6% Ca and 0.90% available P. Thought the experiment lights were on a 16L:8D schedule. Feeders were filled manually every day and egg collection was conducted daily during the morning hours. Body weight and feed intake and feed efficiency were determined weekly throughout the experiment period. Egg production per group, per-cage-hen-day production and quality parameters were performed at of 20, 30, 40 and 50 week of age on the random sample of 30 eggs per treatment. Totally 30 eggs were collected (in the morning) from each group for 2 consecutive days and stored at 4°C overnight and then broken onto a level surface. Percentage of cumulative mortality of laying hens were recorded during the rearing and laying periods. Egg height, width and shell thickness 8 mm were measured by using micrometer screw from Mitutoya. The height of the albumen and yolk were measured by using tripod micrometer. The width of the albumen and yolk were measured by using a standard caliper. Yolk color was measured with a Roche yolk color fan scale (Roche scale). Statistical analysis was performed using the mixed model and t-test procedure of SPSS 15.0. Tukey's test was used to separate group means. A significant difference was at $P < 0.05$.

## RESULTS AND DISCUSSIONS

Housing system and the strains have an important influence on the productive performance (Moorthy et al., 2000; Singh et al., 2009) and egg quality parameters of laying hens (Vits et al., 2005). Results of hen-egg production, feed consumption, feed efficiency and mortality are presented in Table 1. LB had higher egg production and lower feed consumption than AS both at week 40 and 50 ($P<0.05$). The observation concerning egg production of LB hens made in this study was agree to those obtained by Küçükyılmaz et al, 2012. In addition, a significant effect of strain on feed efficiency was observed in all periods of trial ($P<0.05$). On the other hand, the AS hens had a significantly higher body weight (2074.1 g and 1900.2 g respectively) and lower mortality rate (7.1% and 12.7 % respectively); than LB hens at week 50 ($P<0.05$).

Shell and internal quality of egg is important for the economic success of a producer and also consumer demands (Singh et al., 2009). Egg quality may be influenced by several factors including housing regimen, hen strain and nutritional values. There are differences in egg quality parameters between different strains (Hocking et al., 2003). In this study, we no found significant difference between strains regarding the egg shape index, shell weight and shell thickness regarding appearance from 20 to 50 week of age (Table 2). However, the egg weight of LB hens was higher than that of AS hens at week 30, 40 and 50 ($P<0.05$). Similar results were reported by Basmacioglu and Ergul, 2005, but, our results of shell thickness of egg differ from Küçükyılmaz et al., 2012 who found the egg shell thickness of eggs from LB hens were higher than that of eggs from AS layer hens in conventional and organic rearing systems.

The strain has effects on yolk and albumen quality characteristics of eggs (Tumova et al., 1993). The effects of strains on albumen height, albumen width, and yolk height and yolk width are shown in Table 3. In our study, we no found the significant differences between strains housed in furnished cages at wk 20, 30, 40 and 50 ($P>0.05$). In contrast, Leyendecker et al. (2001) found significantly higher yolk weight in white egg chickens (Lohmann LSL) in comparison with the brown Lohmann Tradition.

The strain influenced cracked and dirty egg numbers markedly (Table 4). The cracked egg numbers from LB hens at 40 week and 50 were higher than those from AS hens but less dirty egg numbers ($P<0.05$). Eggs from LB and AS hens had similar yolk color.

Table 1. Production performance of Lohmann Brown and Atak-S laying hens housed in furnished cages from 20 to 50 weeks of age

| Period | Hen-egg production (%) | | Feed consumption (g/hen per d) | | Feed efficiency (g of feed/g of egg) | | Mortality (%) | |
|---|---|---|---|---|---|---|---|---|
| | LB | AS | LB | AS | LB | AS | LB | AS |
| Wk 20 | 24.1±1.11 | 26.0±1.12 | 98.6±0.44 | 100.7±0.44 | 2.23$^{b}$±0.04 | 2.34$^{a}$±0.04 | 0.4±0.001 | 0.5±0.001 |
| Wk 30 | 91.9±1.17 | 89.0±1.06 | 106.7±0.46 | 115.4±0.45 | 2.14$^{b}$±0.02 | 2.26$^{a}$±0.03 | 2.8$^{a}$±0.05 | 1.8$^{b}$±0.01 |
| Wk 40 | 96.1$^{a}$±1.18 | 84.9$^{b}$±1.15 | 108.1$^{b}$±0.47 | 120.6$^{a}$±0.47 | 2.05$^{b}$±0.01 | 2.24$^{a}$±0.03 | 8.0$^{a}$±0.07 | 3.0$^{b}$±0.05 |
| Wk 50 | 88.9$^{a}$±1.16 | 82.1$^{b}$±0.05 | 112.9$^{b}$±0.48 | 120.4$^{a}$±0.48 | 2.01$^{b}$±0.01 | 2.18$^{a}$±0.02 | 12.7$^{a}$±0.10$^{a}$ | 7.1$^{b}$±0.09 |

$^{a,b}$Means± SE within each period with different superscript letters are significantly different ($P < 0.05$).
LB = Lohmann Brown; AS= Atak-S

Table 2. Weight, shape index, shell weight and shell thickness of eggs of Lohmann Brown and Atak-S laying hens housed in furnished cages from 20 to 50 weeks of age

| Period | Egg weight (g) | | Shape index | | Shell weight (g) | | Shell thickness (mm) | |
|---|---|---|---|---|---|---|---|---|
| | LB | AS | LB | AS | LB | AS | LB | AS |
| Wk 20 | 46.7±0.17 | 45.2±0.16 | 77.6±0.35 | 77.6±0.35 | 6.23±0.07 | 6.04±0.04 | 0.32±0.006 | 0.33±0.007 |
| Wk 30 | 60.3$^{a}$±0.28 | 57.1$^{b}$±0.25 | 77.4±0.35 | 75.8±0.33 | 6.62±0.08 | 6.44±0.06 | 0.30±0.004 | 0.30±0.005 |
| Wk 40 | 62.8$^{a}$±0.32 | 60.9$^{b}$±0.76 | 76.6±0.34 | 74.5±0.33 | 6.70±0.08 | 6.67±0.08 | 0.29±0.003 | 0.31±0.003 |
| Wk 50 | 64.8$^{a}$±0.32 | 62.4$^{b}$±0.47 | 77.2±0.27 | 76.7±0.38 | 7.1±0.08 | 7.4±0.11 | 0.27±0.003 | 0.28±0.004 |

$^{a,b}$Means± SE within each period with different superscript letters are significantly different ($P < 0.05$).
LB = Lohmann Brown; AS= Atak-S

Table 3. Albumen height and width, yolk height and width of eggs of Lohmann Brown and Atak-S laying hens housed in furnished cages from 20 to 50 weeks of age

| Period | Albumen height (mm) | | Albumen width (cm) | | Yolk height (mm) | | Yolk width (mm) | |
|---|---|---|---|---|---|---|---|---|
| | LB | AS | LB | AS | LB | AS | LB | AS |
| Wk 20 | 9.6±0.11 | 9.8±0.12 | 6.5±0.12 | 6.5±0.12 | 18.8±0.11 | 18.9±0.11 | 39.2±0.24 | 39.0±0.23 |
| Wk 30 | 9.5±0.10 | 9.2±0.10 | 6.5±0.15 | 6.4±0.14 | 18.5±0.10 | 18.8±0.10 | 39.8±0.13 | 39.9±0.22 |
| Wk 40 | 9.5±0.09 | 9.8±0.10 | 6.9±0.21 | 7.3±0.11 | 18.8±0.11 | 18.5±0.12 | 40.1±0.13 | 41.5±0.16 |
| Wk 50 | 9.5±0.09 | 9.3±0.09 | 7.5±0.22 | 7.4±0.16 | 18.7±0.12 | 19.2±0.11 | 40.8±0.21 | 42.4±0.19 |

$^{a,b}$Means± SE within each period with different superscript letters are significantly different ($P < 0.05$).
LB = Lohmann Brown; AS= Atak-S

Table 4. Cracked, dirty eggs and yolk color of Lohmann Brown and Atak-S laying hens housed in furnished cages from 20 to 50 weeks of age

| Period | Cracked eggs (%) | | Dirty eggs (%) | | Yolk color | |
|---|---|---|---|---|---|---|
| | LB | AS | LB | AS | LB | AS |
| Wk 20 | 4.80±0.04 | 4.88±0.04 | 0.07±0.001 | 0.02±0.001 | 11.1±0.11 | 11.0±0.09 |
| Wk 30 | 3.80±0.04 | 3.90±0.03 | 0.23$^{b}$±0.001 | 0.46$^{a}$±0.003 | 12.0±0.13 | 11.6±0.11 |
| Wk 40 | 2.41$^{a}$±0.02 | 1.42$^{b}$±0.01 | 0.05$^{b}$±0.001 | 0.10$^{a}$±0.001 | 11.7±0.13 | 11.9±0.14 |
| Wk 50 | 2.08$^{a}$±0.02 | 1.35$^{b}$±0.02 | 0.10$^{b}$±0.001 | 0.17$^{a}$±0.001 | 12.1±0.16 | 12.1±0.12 |

$^{a,b}$Means± SE within each period with different superscript letters are significantly different ($P < 0.05$).
LB = Lohmann Brown; AS= Atak-S

## CONCLUSIONS

Our results showed that strain selection is important for productivity of laying hens rearing in furnished cages. Furthermore it can be concluded that performance of LB hens was better than AS hens in furnished cages.


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