

Productive performance and qualitative egg characteristics of two local lines chickens and laying brown Lohmann

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Abstract: This study was conducted to compare the productive performance of two local lines chickens (black and brown-feathered chickens) and laying brown Lohmann strain for the period from 4- 6 months of age. The birds were divided into three treatments, the first treatment Local black, the second local brown, and the third brown Lohmann, with 15 females and 3 males from each group divided into three replicates (1 ♂: 5 ♀). The following characteristics were studied: live body weight, age of sexual maturity, weight of the first egg, average weight of eggs, egg production % HD, egg mass, feed conversion ratio and egg specific characteristics for the three groups. The results indicated that there were significant differences ($P < 0.05$) in the characteristic of live body weight at sexual maturity and at 6 months of age in favor of brown Lohmann, which was 1207.2, 1032.1, 1109.7 g and 1379.6, 1207.4, 1219.8 for the Lohmann brown chicken, local brown chicken and black local chicken. Also, the brown Lohmann chickens showed the lowest age of sexual maturity of 138.13 days, which was significantly ($P < 0.05$) superior to the local brown chickens' 143.00 days, which in turn was significantly superior to the black local chickens 148.33 days. The black local chickens achieved a significant ($P < 0.05$) superiority in the weight of the first egg and egg weight compared to the local brown and brown Lohman chickens. As for the number of eggs produced/female, egg mass, HD% egg production and feed conversion efficiency egg shape index, the brown Lohman outperformed the local chickens. As for the albumen weight, shell thickness, the local black and Lohmann chickens outperformed the local brown chickens. As for the characteristic of high yolk and yolk weight, the local chickens of both types were superior to the Lohmann strain. As for the characteristic of high whiteness, the local brown and brown Lohmann chickens outperformed the black local chickens. As for the egg length the local black and local brown outperformed the Lohmann chickens. while the shell weight was no significant differences between the three groups.

Keywords: local breeds, Lohmann brown laying, egg production, egg quality characteristics.

الأداء الإنتاجي وصفات البيض النوعية لخطين من الدجاج المحلي واللوهمان البني البياض

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المستخلص: أجريت هذه الدراسة لمقارنة الأداء الإنتاجي لخطين من الدجاج المحلي (دجاج أسود الريش ودجاج بني الريش) وسلالة اللوهمان البني البياض للفترة من عمر 4 - 6 أشهر. قُسمت الطيور إلى ثلاث معاملات المعاملة الأولى أسود محلي والثانية بني محلي والثالثة لوهمان بني بواقع 15 انثى و3 ذكور من كل مجموعة مقسمة إلى ثلاث مكررات بواقع (1 ♂: 5 ♀) وتم دراسة الصفات التالية: وزن الجسم الحي، عمر النضج الجنسي، وزن أول بيضة، متوسط وزن البيض، إنتاج البيض % H.D، كتلة البيض، معامل التحويل

الغذائي وصفات البيض النوعية للمجموعات الثلاثة. أشارت النتائج إلى وجود فروقات معنوية ($P<0.05$) في صفة وزن الجسم الحي عند النضج الجنسي وعند عمر 6 أشهر لصالح اللوهمان البني اذ بلغ 1207.2، 1032.1، 1109.7 غم و1379.6، 1207.4، 1219.8 غم لدجاج اللوهمان البني والدجاج المحلي البني والدجاج المحلي الأسود على التوالي. كذلك أظهر دجاج اللوهمان البني أقل عمر للنضج الجنسي بلغ 138.13 يوماً تفوق فيه معنوياً ($P<0.05$) على الدجاج المحلي البني 143.00 يوم والذي بدوره تفوق معنوياً على الدجاج المحلي الأسود 148.33 يوم. هذا وقد حقق الدجاج المحلي الأسود تفوقاً معنوياً ($P<0.05$) في وزن أول بيضة ووزن البيضة مقارنة بدجاج اللوهمان البني والمحلي البني، أما عدد البيض المنتج /انثى، كتلة البيض، نسبة إنتاج البيض % H.D. وكفاءة التحويل ودليل الشكل الغذائي تفوق اللوهمان البني على الدجاج المحلي. أما بالنسبة لوزن البياض وسمك القشرة فقد تفوق الدجاج المحلي الأسود ولوهمان على المحلي البني، أما صفة ارتفاع الصفار ووزن الصفار فقد تفوق الدجاج المحلي بنوعيه على سلالة اللوهمان، أما صفة ارتفاع البياض تفوق الدجاج المحلي البني ولوهمان البني على الدجاج المحلي الأسود، أما بالنسبة لطول البيضة فتفوقت الدجاج المحلي الأسود والبني على دجاج اللوهمان البني، بينما وزن القشرة لم تشير إلى وجود اختلافات معنوية بين المجموعات الثلاثة.

الكلمات المفتاحية: السلالات المحلية، اللوهمان البني البياض، إنتاج البيض، خصائص جودة البيض.

Introduction.

The local Iraqi chickens are considered among the resources of low genetic value and important for their ability to adapt to harsh conditions when raised in a non- standard environment (Murrani et al. 1997). In order to collect the local genes from Iraqi chickens, across- section breeding and purification of the genetic lines of the original chicken according to the color of the feathers to produce breeds adapted to environmental conditions was carried out by two Iraqi institutions, the first is the Scientific Research Council in 1986 and the second is the IPA Agricultural Research Center in 1992- 2003. Both succeeded in producing six genetic lines of local chickens, namely (brown and black, white, striped, white bare- necked, and brown bare- necked (Al- Athari et al., 2002). After conducting studies that proved that these six lines responded well to improving environmental condition, especially nutrition, and showed an improvement in body wight when Sexual nutrition and egg weight (Al- Anbari, 2019). Local chickens are substantially immune compared to other breed in Iraq, making it easy to improve their production capacity and performance (Al- Anbari, 2019). On the other hand, local chickens adapt to the weather in Iraq where the climate is too hot in the long summer months and the very cold weather in winter, which makes it the original local chicken in Iraq, so it must be preserved genetically. Several genetic parameters can be used to improve the performance of local Iraqi chickens while conserving their Iraqi identity. Foreign breeds of laying chickens, including the brown Lohmann, which is characterized by a track record of distinguished electoral criteria, such as a high growth rate, ease of adaptation to different environments, good food conversion rate, and excellent egg quality (Ohman's evidence), that differ significantly from local chickens in their product performance, and this is what was indicated by (2011, Razuki and Al- Shaheen)) that there are significant differences in body weight, age of sexual maturity, egg weight and the number of eggs produced between a local breed, which is the structure, and foreign breeds, New Hampshire and White Lakhorn as well. Also, in general, the characteristics of egg quality have a genetic basis, this difference between breeds was reflected in the percentages of specific egg components (Scott and Silversides, 2000).

(Pandey et al. 1986) pointed out that there is a difference in egg quality characteristics such as egg weight, eggshell thickness, yolk and white weight, etc. due to genetic differences between breeds. Several studies also showed that chickens with colored feathers lay larger eggs than chickens with white feathers (Halaj and Grofik, 1994; Vits et al.; 2005). Mekky et al. (2008) studied two breed of chicken, the local Egyptian (Fayoumi and Sinai), and two strains of the foreign species (the Rhode Island Red and white Leghorn). A previous study pointed out differences in body weight, egg weight, and egg production among the different breeds due to genetic differences (Mekky et al., 2008). Also, (Abdulla et al., 2016) noticed there are significant differences in egg characteristics of egg weight, yolk weight and shell when they were studied on three different lines of local chickens and Isa Brown. This study aimed to compare the productive performance of two lines of local chickens with different plumage color (black and brown) with the foreign chicken Lohmann brown.

Materials and methods.

This study was conducted in the animal production / College of Agriculture and Forestry / University of Mosul from (10/2/2021) to (10/5/2021) to compare the production performance of two lines of local chickens with the different colors feather, namely (black and brown) with foreign chickens (Lohmann brown) for 4- 6 months of age. The birds were divided into three treatments, the first treatment was local black, the second local brown, and the third treatment was brown Lohmann, with 15 females and three males from each strain divided into three replicates by (1♂: 5♀). Live body weight, age of sexual maturity, the weight of the first egg, average egg weight, egg production % HD, egg mass, feed conversion factor and specific egg characteristics for the three groups were compared. The birds were housed in a semi- open hall with replicates distributed on both sides of the hall with dimensions (3 x 1.5 m) separated by a service corridor with a width of (2 m) equipped with a suspended cylindrical feeder and a suspended automatic manhole for each repeater. The temperatures were set and monitored through thermometers placed along the hall at a back level of the reached (25 ° C) during the breeding period. All birds were fed on a similar production ration with equal quantities of feed for all treatments according to the breeding guide followed for Lohmann chickens with a representative energy content of (2800 kcal/kg of feed) and a level of crude protein (18%). Eggs were collected twice daily, in the morning and evening, and individually weighed in an electronic balance with a sensitivity of 0.01 g. Egg production was calculated on the basis of HD%. The specific characteristics of the egg were measured from yolk color, egg weight, shell weight, egg length and width, yolk and white height, and shape guide after breaking the egg on a flat surface using an electronic Vernier measuring machine.

The statistical analysis:

The statistical analysis program (SAS.2001) was used to analyze the studied traits using the CRD random design, and the means were compared according to Duncan's Test (1955) for all the traits dealt with in the study.

Results and discussion.

The results of the statistical analysis in Table (1) showed significant differences ($P < 0.05$) in live body weight at the age of sexual maturity (when laying the first egg). The brown Lohmann chicken achieved the highest weight of 1207.2 g, in which it outperformed the local brown chicken by 1032.1 g, while it was not significantly different from local black chicken, as it was 1109.7 g. At the age of 6 months, the brown Lohmann chicken showed the highest body weight, in which it was significantly superior to the local black and chicken brown together, reaching 1379.6 1219.8 and 1207.4g, respectively. These results were in agreement with (Mekky et al., 2008) when studying it on the local Egyptian, the *Rhode Island Red* and the white Leghorn chicken where they found a significant superiority of the *Rhode Island Red* over the local breeds in terms of body weight. Also (2016, Kamel) studied the local Egyptian Fayoumi strain and the foreign Rhodeland strain, he noticed the superiority of the foreign strain over the local one in body weight due to difference in genetic predisposition to rapid growth between the strains, and perhaps the selection processes that were practiced for these foreign strains. Related the age of sexual maturity, significant differences were observed between the three treatments, where the brown Lohmann chickens were the earliest in age when laying the first egg, which was at 138.13 days, then the local brown chickens who laid eggs at the age of 143 days, and finally the black local chickens who laid eggs at the age of 148.33 days. These results agreed with (Soliman et al., 2020) when it was stated that the White Lohman strain was earlier in the age of sexual maturity (151.40) days than the local Egyptian strain, which reached sexual maturity (182.78) days. These results were contrary to what was found by (Razuki and AL-Shaheen, 2011), where the arrival of local brown chickens mentioned sexual maturity of 141.25 days when compared to white leghorn and New Hampshire. These results also differed with what was indicated by (Omer et al., 2016) of the absence of significant differences in the age of sexual maturity between local and foreign breeds.

Table (1) Effect of strain on body weight at sexual maturity, body weight at 6 mth and age at sexual maturity (Means \pm SE).

Traits/ Strain	BW. SM(g)	BW. 6 m th (g)	A.S.M(day)
L.Bl	1109.7 \pm 0.58 ab	1219.8 \pm 1.10 b	148.33 \pm 0.60 a
L.Br	1032.1 \pm 0.11 b	1207.4 \pm 1.76 b	143.00 \pm 0.58 b
LH.Br	1207.2 \pm 0.10 a	1379.6 \pm 1.17 a	138.13 \pm 0.13 c

*Mean with a different letter in the same column indicate a statistical difference ($P \leq 0.05$). Where is L.Bl = local black, L.Br = local brown, LH.Br = Lohmann brown, BW.SM = body weight at sexual maturity, BW.6 month, A.S.M = age at sexual maturity

From table (2), which shows the productive performance of the three strains, it is clear that there is a significant effect ($P < 0.05$) of the strain in all traits. Regarding the weight of the first egg, the local black chicken showed a significant superiority, as it gave the highest weight of 37.00 g, superiority to the brown Lohmann chicken 35.00 g, while the local brown chicken showed the lowest weight of 33.00 g. These results were in agreement with what was indicated by (Omer et al., 2016), where it was noted that the domestic black with brown necked chicken outperformed the foreign in the weight of the first egg. Whereas, significant differences were recorded in favor of local black and Lohmann hens over local brown in the average egg weight throughout the breeding period between the three treatments, where it was 53.80, 52.30 and 49.30 g in the local black hens, the local brown hens, and the brown Lohmann, respectively, these results were in agreement with what was found (Omer et al., 2016) when studying the local black, brown with neck black, white and Isa brown, and in agreement with (Razuki and AL- Shaheen, 2011), where it was observed that the white leghorn was superior to the local brown (Hermiz et al. 2019) they found a difference in egg weight in favor of the local black on the black with neck brown.

Table (2) Effect of strain on the egg performance from 4- 6 mth (Means \pm SE).

Traits /Strain	F st eg.w	M.eg.w	Egg N./f	Egg M. g	H.D. %	Egg ratio
L.Bl	37.00 \pm 0.58 a	53.80 \pm 0.06 A	23.33 \pm 0.88 b	1255.23 \pm 4.54 b	41.7 \pm 0.15 B	2.3 \pm 0.09 b
L.Br	33.00 \pm 0.32 C	49.30 \pm 0.56 C	20.20 \pm 0.35 c	995.82 \pm 2.72 c	36.1 \pm 0.61 C	3.0 \pm 0.06 a
LH.Br	35.00 \pm 0.53 B	52.3 \pm 0.06 B	27.00 \pm 1.15 a	1411.97 \pm 4.52 a	48.2 \pm 2.09 A	1.9 \pm 0.10 c

*Mean with a different letter in the same column indicate a statistical difference ($P \leq 0.05$). where is L.Bl = local black, L.Br = local brown, LH.Br = lohman brown, Fst eg.w= first egg weight, M.eg.w= mean egg weght, Egg N./f = egg number/female, Egg M.= egg mass, H.D. %= hen day production, Egg ratio= g fed/g egg.

As for the number of eggs produced/female, the results showed a significant ($P < 0.05$) superiority of the Lohmann brown chickens, as it gave the highest number of eggs that reached (27.0) eggs during the breeding period, in which it was significantly superior to the black local chickens (23.37) eggs, while the local brown chickens gave the lowest number of eggs which was (20.20) eggs. These results were in agreement with what was indicated by (Razuki and AL- Shaheen, 2011), where he found the superiority of white leghorn chickens over local brown chickens, and a violation of what was found (Hermiz et al. 2019), where they noticed the superiority of black with brown over local black. This may be due to the adaptation of local chickens to the surrounding environmental conditions, in addition to the interaction between the

effect of genotypes and the environment, which led to a different quality sequence between them. As for the mass of eggs, the results showed the superiority of the brown Lohmann chickens, as it gave the mass of eggs (1411.97) a significant advantage over the local black (1255.23) g, while the local brown chickens gave the lowest egg mass of (995.82) g. As for the egg production (HD%), there was a significant superiority of compared Lohmann brown chickens to local black chickens and local brown chickens, which egg production rate reached 48.2, 41.7 and 36.1%, respectively. The reason for this discrepancy may be attributed to the significant difference in body weight, as indicated by (Renema et al., 2004 and Bruggeman et al., 2005) and this was in disagreement with what was obtained (Omer et al. (2016), where he indicated the superiority of local black and brown-necked black over white and ISA Brown. The brown Lohmann chickens also showed the best efficiency in converting food into eggs compared to the local black chickens and the brown local chickens, as the feed conversion factor was 1.9, 2.3 and 3.0 g feed / g eggs for the above breeds, respectively.

The results of the statistical analysis indicated that there was a significant effect of the breed ($P < 0.05$) in the internal egg characteristics as shown in Table (3), where the brown Lohmann chickens outperformed the brown local chickens in the weight of the albumen and did not differ significantly with the black local hens, as it was 30.0, 27.77 and 32.27 g, and there were significant differences between the three breeds in the weight of the yolk, as it was 16.07, 16.00 and 13.53 g in the local black, brown and Lohmann chickens, respectively.

Table (3) Effect of strain on the internal egg traits (Means \pm SE).

Traits / Strain	Alb. W	Yol. W	Yol. h	Alb.h
L.Bl	30.00 \pm 0.58 ab	16.07 \pm 0.27 a	14.00 \pm 0.38 a	6.57 \pm 0.03 b
L.Br	27.77 \pm 0.89 b	16.00 \pm 0.57 a	14.20 \pm 0.46 a	8.67 \pm 0.19 a
LH.Br	32.27 \pm 1.18 a	13.53 \pm 0.09 b	12.63 \pm 0.29 b	9.26 \pm 0.26 a

*Mean with a different letter in the same column indicate a statistical difference ($P \leq 0.05$). Where is L.Bl = local black, L.Br = local brown, LH.Br = Lohmann brown, Alb. W= albumen weight (g), Yol. W= yolk weight (g), Yol. h =yolk high (mm), Alb.h= albumen high (mm).

As for the height of the yolk, the local black and brown chickens outperformed the Lohmann chickens, reaching 14.00, 14.20 and 12.63 mm, respectively, while the Lohmann and the local brown chickens outperformed the black local chickens in the height of the albums, which reached 9.26, 8.67 and 6.57 mm, respectively. These results were in agreement with what was found by Abdulla (and others, 2016) and (Al- Tikriti, 2011), who indicated the existence of a significant effect of the strain on the internal characteristics of eggs.

As for the external egg characteristics shown in Table (4), there is a significant effect ($P < 0.05$) of the breed in it. Regarding egg width, the brown Lohmann chickens were superior to the brown local chickens, while they were not significantly different from the black local chickens, as it reached 42.37,

39.25 and 40.89 mm. respectively. Also there were significant differences in egg length and egg shape index between the three breeds, where the egg length was 53.37, 53.10 and 51.93 mm, while the egg shape index was 76.61, 73.03 and 81.63 for the local black, local brown and brown local chickens, respectively, while there were differences no Significantly, in shell weight, the Lohmann brown chicken, local brown chicken and the black local chicken, where it was 6.75, 5.75 and 6.25 g, respectively. As for the thickness of the shell, there were significant differences between the breeds, as it was 0.42, 0.38 and 0.35 mm for local black, brown Lohmann, and local brown chickens, respectively. These results were in disagreement with what was found by (Abdulla et al., 2016), who indicated that there was no significant effect between local black, brown-necked black and white, and Isa Brown on the thickness of the crust.

Table (4) Effect of strain on the external egg traits (Means \pm SE).

Traits/ Strain	Eg.Wi (mm)	Eg.Le (mm)	Eg.I	Sh.W (g)	Sh.Th (mm)
L.Bl	40.89 \pm 0.05 ab	53.37 \pm 0.31 a	76.61 \pm 0.41 b	6.25 \pm 0.20 a	0.42 \pm 0.02 a
L.Br	39.25 \pm 0.56 b	53.10 \pm 1.23 a	73.93 \pm 1.31 b	5.75 \pm 0.01 a	0.35 \pm 0.02 c
LH.Br	42.37 \pm 0.57 a	51.93 \pm 0.58 b	81.63 \pm 2.20 a	6.75 \pm 0.58 a	0.38 \pm 0.01 b

*Mean with a different letter in the same column indicate a statistical difference ($P \leq 0.05$). Where is L.Bl = local black, L.Br = local brown, LH.Br = Lohmann brown, Eg.Wi= egg width, Eg.Le= egg length, Eg.I= egg index, Sh.W= shell weight, Sh.Th= shell thickness

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