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Effect of Storage and Weight of Egg on Post-Hatching Performance of Local Ducks

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The effect of treatments: storage time (0, 3, and 7 days), and egg weight (small<58 g; medium: 57.99 – 64.99 g; large> 65 g) on the performance of local ducks were studied. Incubation of 785 eggs was carried out in a commercial incubator and after hatching 162 ducklings were weighed and distributed into nine treatments (18 ducks each). Live body weight, feed intake, weight gain, and feed conversion ratio were recorded during the experiment period of 42 days. Results showed that at all periods the live body weight of ducks from large eggs was significantly ($p<0.05$) and numerically heavier compared with ducks from the medium and small eggs of the three storages. While the ducks from T12 were significantly or numerically higher feed intake compared with other treatments at all periods. The weight gain and feed conversion ratio were also significantly affected

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by treatments vibratory in different periods. Generally, Duck from T22 at (1-7 and 36-42) day, T12 at (8-14) day, T11 and T21 at (15-21) day, and T33 at (22-28) day had significantly higher weight gain. Ducks from T23 at (8-14) day, T33 at (15-21) day, T21 and T23 at (22-28) day and T13 at (36-42) had significantly and numerically lower feed conversion ratios. Since optimum duckling performance can only be achieved when chicks hatch from egg weights were considered according to storage times.

Keywords: Local ducks; egg storage; egg weight; performance.

1. INTRODUCTION

Ducks belong to several families such as Anatidae, Anseriformes, and Anas platyrhynchos [1]. The main purpose of duck rising in Asia is to produce meat and eggs. Wild ducks comprise 29 species and represent about 7% of the total number of birds recorded from Iraq [2-4]. Duck ii one of the waterfowl found widely in south Iraq, which is used for the production of meat and eggs [5]. In the Iraqi Kurdistan Region also duck was used in meat production spicily during the cold seasons. The most raised ducks in the Kurdistan Region were in the villages as pastured. But in the last years, there is a tendency to breed in extensive systems. The research of local ducks was widely studied in different countries Isguzar [6] in Turkey; Ismoyowati et al. [7] and Widiyaningrum and Utami [8] in Indonesia; Naik et al. [9] in India; Setioko [10] in Taiwan; Indarsih and Sukartha Jaya [11] in Iran; Rashed et al. [12] and Jalil et al. [13] in Bangladesh; Rizk et al. [14] in Brazil; Abd El-Hack et al. [15] in Egypt; Mohammad [16-24] In Iraq, the studies on the local duck were to determine the evaluation of the local duck [5] and the use of Gompertz model was used to describe the growth curve [25]. No statistical data on the effect of egg storage and egg weight on local duck potential in the Iraqi Kurdistan Region was studied. For these reasons, we aimed to study the effect of three different storages and three different weights of egg on the local duck's performance.

2. MATERIALS AND METHODS

The study was performed on the research farm of the Department of Animal Science, College of Agricultural Engineering Sciences, Suleimani University, Kurdistan Region, Iraq. A total of 785 eggs were collected from different areas of Suleimani City and incubated in the hatchery after storied as three storage periods: storage for 0 days (226 eggs); storage for 3 days (204 eggs) and 7 days (241 eggs) days. In each egg storage period, each egg was weighed individually into three different weights: (small<58 g; medium: 57.99 – 64.99 g; large> 65 g) were described in Table 1.

After hatching in each storage period, the duckling was weighed individually for each egg weight and randomly divided into treatments (18 ducks each). Duck weight, feed intake, weight gain, and feed conversion ratio (feed g/ gain g) were recorded weekly.

2.1 Birds and Housing

The study used 162 local ducks one-day old age, divided into nine treatments (3 replicates each) and the size of each cage was (1×1.1) m. Ducks were kept in 27 pens net floor (6 ducks each). The experiment period continues for 42 days. The body weight of the birds was recorded at hatch and weekly, and feed intake, body weight gain, and feed conversion ratio were recorded weekly.

Table 1. Distribution of treatments

Treatments		
T	**Storage Periods**	**Egg Weight (g)**
T11	1 (7 days)	1 (65>)
T12		2 (58 -64.99)
T13		3 (57.99<)
T21	2 (3 days)	1 (65>)
T22		2 (58-64.99)
T23		3 (57.9<)
T31	3 (0 days)	1 (65>)
T32		2 (58-64.99)
T33		3 (57.99<)

The experiment was conducted from March to April. Throughout the 42-day growth period, ducks were kept in a conventional poultry building without outdoor access. In the first week of age, the temperature was 30–32 ◦C in the rearing area (under the infrared heater) and 23–24 ◦C inside the building. It was later reduced by 2–3 ◦C each week under the heater and by 1 ◦C in the rearing area. From 22 d of age, the air temperature was 21 ± 1 ◦C. Relative humidity during rearing was 60%–70%.

2.2 Feeding Program and Diets

At starter face 1 to 21 d of age, birds were fed a complete commercial diet for fattening ducks in crumble form. The starter diets contained 21.25% CP (crude protein) and (3020 kcal) ME (metabolizable energy) per kilogram of feed. At grower faces from 22 to 42 d of growth, ducks received a complete commercial grower/finisher diet containing 19.5% CP and (3090 kcal) ME.

2.3 Statistical Methods

The effect of each treatment (0, 3, 7) days of storage and small, medium, and large eggs in each storage were determined. When differences among treatments were significant, means were separated using Duncan's multiple range tests at the 0.05 level of significance [26,27]. The analyses were conducted using XLSTAT-Premium 02.28451 (XLSTAT, 2016).

3. RESULTS AND DISCUSSION

3.1 Effect of Treatments on Performance

3.1.1 Body weight

Effects of treatments (egg storage and egg weights) in Table 2 showed a vibration in significantly heavier weights in all periods. Whereas, ducks in T21 at ages 1 day; ducks in T11 at 7–days; ducks in T31 at 21, 28, 35, and 42 day-olds showed significant ($p<0.05$) and numerically heavier weights followed by ducks in T11 and T31 compared with other treatments. These results might be due to a high correlation between the weights of eggs and chick weights Wilson, H. R. [8] and Khurshid et al. [13], with the heaviest egg as the heaviest hatching chick [28]. The findings in this study regarding the effect of hatching egg weight on hatching weight were similar to those reported for quail and breeding broiler eggs [29-36]. Yılmaz et al. (2008) found hatch weights and 1, 3, and 11 weeks did not significantly affect by storage and egg weights, body weights in the 5 and 7 weeks of age were significantly affected by both egg weight and length of storage period. However; they also found that in ducks hatched from eggs at different durations and weights, live weight gains gradually decreased after 9 weeks of age. Accordingly; some researchers [37,14,38] showed that chicks hatched from similar egg weights stored for different days had similar initial weights. Idahor et al. (2015) found that hatched duckling weights did not significantly differ between different egg weights. Egg weight did not affect broilers' final live body weight, feed conversion ratio, feed intake, and mortality [39]. There was no hatching egg weight x length of egg storage period interactions on apparent fertility, hatchability of total and fertile eggs, body weight at hatch, and 4,2 d of age [40].

3.1.2 Feed intake

The effect of treatments on feed intake was shown in Table 3, approximately the ducks from T12 were significantly or numerically higher compared with other treatments at all periods. Whereas, at (22-28 and 29-35) day-old age the feed intake in T12 numerically would lower than T23 and T21, respectively. The effect of egg weight on feed intake was observed in storage 1. The ducks from medium eggs were significantly higher compared with ducks from small eggs in the same storage at (1-7, and 8-14) day-old age. While at (29-35) day-old, the ducks from medium eggs significantly intake higher feed compared with ducks from large eggs in the same storage. At (36-42) day-old ducks from medium eggs were significantly higher compared to large and medium eggs in storage 1. However, these results were in contrast with the founding by Yılmaz et al. (2008), who determined that storage time and hatching egg weight did not significantly affect the two weeks of feed consumption. In addition, Iqbal et al. [41] reported that egg weights did not significantly affect feed intake. While Abiola et al. [42] found that in the starter phase, daily feed intake increased with an increase in the size of eggs from where the chicks hatched, while in the finisher phase, there was an inverse relationship between feed intake and the size of eggs from where the chicks hatched. İpek, A., and Sözcü, A. [11] showed that heavier ducklings consumed more feed and grew more than lighter ones. İpek, A., and Sözcü, A. [11] found that cumulative feed consumption was also found to be the highest

Table 2. Effect of treatments on live body weight at different ages of local ducks

Treatment			Live Body Weight (g)						
*T**	**Egg storage (day)**	**Egg weight (g)**	Age (day)						
			1	**7**	**14**	**21**	**28**	**35**	**42**
T11	**1 (7)**	**1 (65>)**	43.94abc±2.48	173.887a ±21.994	416.053a±47.421	868.47a±70.08	1135.00ab±42.01	1576.67ab±60.09	1742.33bc±37.09
T12		**2 (58 -64.99)**	42.93bc±1.671	147.63a±30.114	398.67ab±65.621	840.05a±93.355	1120.0ab±117.77	1580.0ab±117.19	1835.00ab±65.68
T13		**3 (57.99<)**	32.11d ±0.772	117.44b ±15.687	290.397c ±36.385	660.55b ±46.718	983.78b ±48.67	1450.00b ±41.94	1621.67cd±40.86
T21	**2 (3)**	**1 (65>)**	46.91a ±0.311	169.93a ±18.243	400.28ab ±44.872	859.23a ±82.78	1221.11a ±67.87	1688.33a ±42.28	1801.67ab±56.45
T22		**2 (58-64.99)**	40.61c ±0.242	166.61a ±37.824	333.39bc ±32.843	745.55ab ±36.02	1144.44ab ±44.32	1600.55ab ±65.35	1881.67ab±74.07
T23		**3 (57.9<)**	33.94d ±1.011	108.86b ±2.842	308.90c ±3.822	636.99b ±36.10	975.83b ±75.62	1485.00b ±77.18	1706.67bc±131.9
T31	**3(0)**	**1 (65>)**	45.33ab ±0.882	171.61a ±22.201	407.05ab ±58.856	883.33a ±123.03	1303.11a ±262.17	1701.67a ±394.55	1896.67ab±23.33
T32		**2 (58-64.99)**	41.39c ±0.217	156.61a ±20.144	391.65ab ±45.184	780.55ab ±73.913	1180.55ab ±98.88	1496.55b ±44.68	1790.00abc ±9.24
T33		**3 (57.99<)**	32.86d ±1.255	106.67b ±5.584	311.49c ±4.945	691.55b ±21.804	1090.99ab ±57.00	1459.89b ±39.19	1821.33ab±26.20

a-b values within a column with different superscripts differ significantly (P < 0.05)

Table 3. Effect of treatments on daily feed intake of local ducks at different ages

Treatments			Daily Feeding Intake (g)					
T	**Egg Storage (day)**	**Egg Weight (g)**	Age (day)					
			1-7	**8-14**	**15-21**	**22-28**	**29-35**	**36-42**
T11	**1 (7)**	**1 (65>)**	33.10ab±3.645	44.44abcd±2.78	86.91 ab±8.33	125.00 a±10.31	113.730 b±6.23	128.97 b±7.15
T12		**2 (58 -64.99)**	34.76 a±1.26	54.17 a±4.167	108.93 a±12.67	142.22 a±14.30	137.98 a±6.57	162.50 a±12.50
T13		**3 (57.99<)**	20.64 d±0.39	41.667 bcd±0.00	77.38 b±0.00	111.11 a±7.15	123.41 ab±4.14	125.00 b±0.00
T21	**2 (3)**	**1 (65>)**	30.15abc±2.34	51.587 ab±2.86	109.524 a±10.38	136.905 a±7.24	139.762 a±7.38	141.67 ab±8.33
T22		**2 (58-64.99)**	29.37abc±2.81	49.60 abc±4.47	105.16 ab±1.98	134.52 a±5.19	127.86 ab±8.82	141.67 ab±8.33
T23		**3 (57.9<)**	27.50bcd±3.61	51.39 ab±6.05	104.17 ab±18.10	145.24 a±20.76	134.52 ab±10.58	146.63 ab±7.99
T31	**3 (0)**	**1 (65>)**	24.60 cd±0.79	39.68 cd±1.98	79.76 ab±4.18	121.03 a±3.97	119.44 ab±2.78	130.95 b±0.00
T32		**2 (58-64.99)**	27.38bcd±0.69	37.70 d±1.98	83.333 ab±6.30	121.03 a±3.97	121.43 ab±4.76	130.95 b±0.00
T33		**3 (57.99<)**	21.43 d±0.69	35.71 d±0.00	75.40 b±3.97	117.06 a±5.25	130.95 ab±0.00	130.95 b±0.00

a-b values within a column with different superscripts was differ significantly (P < 0.05).

Table 4. Effect of treatments on daily weight gain of local ducks at different ages

Treatments			**Daily Weight Gain (g)**					
T	**Egg storage (day)**	**Egg weight (g)**	**Age (day)**					
			1-7	**8-14**	**15-21**	**22-28**	**29-35**	**36-42**
T11	**1 (7)**	**1 (65>)**	15.52 ab±3.16	29.60 ab±3.63	58.35 a±4.51	43.68 abcd±4.01	63.25 a±2.60	37.02 cd±8.85
T12		**2 (58 -64.99)**	16.55 ab±4.14	37.03 a±5.66	51.06 ab±4.56	47.56 abcd±6.69	58.81 a±4.88	47.54bcd±10.32
T13		**3 (57.99<)**	12.19 b±2.32	23.34 bc±3.07	49.34 abc±3.85	50.62 abcd±0.62	67.06 a±5.60	24.52 d±0.28
T21	**2 (3)**	**1 (65>)**	13.51 b±2.61	29.54 ab±4.54	58.66 a±5.76	30.87 d±2.26	66.59 a±5.38	41.51 bcd±10.32
T22		**2 (58-64.99)**	23.31 a±5.37	22.10 bc±0.71	46.25 abc±9.33	38.41 cd±4.55	55.08 a±6.96	92.38 a±4.14
T23		**3 (57.9<)**	10.70 b±0.55	20.20 bc±0.95	38.14 bc±4.65	41.59 bcd±10.16	59.13 a±2.60	80.24 abc±29.86
T31	**3 (0)**	**1 (65>)**	9.30 b±0.15	18.59 bc±2.89	31.68 c±5.47	60.14 ab±2.17	59.92 a±6.39	84.84 ab±14.38
T32		**2 (58-64.99)**	14.87 ab±2.90	26.98 abc±3.58	48.21 abc±4.68	52.05 abc±3.86	46.59 a±12.68	65.30 abcd±7.30
T33		**3 (57.99<)**	8.54 b±0.88	16.33 c±0.09	14.94 d±3.75	63.04 a±10.93	65.87 a±2.78	43.41 bc±6.16

a-b values within a column with different superscripts differ significantly (P < 0.05)

Table 5. Effect of treatments on daily feed conversion ratio at different ages local duck

Treatments			**Daily feed conversion ratio**					
T	**Egg Storage (day)**	**Egg Weight (g)**	**Age (day)**					
			1-7	**8-14**	**15-21**	**22-28**	**29-35**	**36-42**
T11	**1 (7)**	**1 (65>)**	2.26 a±0.31	1.54 b±0.19	1.49 b±0.07	2.95 ab±0.49	1.80 a±0.09	3.670 ab±1.53
T12		**2 (58 -64.99)**	2.36 a±0.54	1.52 b±0.21	2.15 b±0.21	3.06 ab±0.33	2.39 a±0.29	3.74 bc±0.77
T13		**3 (57.99<)**	1.80 a±0.28	1.85 ab±0.26	1.59 b±0.12	2.20 ab±0.16	1.87 a±0.18	5.768 a ±0.11
T21	**2 (3)**	**1 (65>)**	2.43 a±0.52	1.83 ab±0.29	1.89 b±0.19	4.48 a±0.41	2.12 a±0.18	3.74 bc±0.69
T22		**2 (58-64.99)**	1.51 a±0.55	2.25 ab±0.21	2.45 b±0.45	3.62 ab±0.49	2.45 a±0.49	1.54 c±0.13
T23		**3 (57.9<)**	2.60 a±0.42	2.55 a±0.28	2.86 b±0.64	4.44 a±1.93	2.27 a±0.14	2.51 bc±0.96
T31	**3 (0)**	**1 (65>)**	2.65 a±0.13	2.26 ab±0.40	2.63 b±0.33	2.01 b±0.01	2.06 a±0.29	1.63 c±0.25
T32		**2 (58-64.99)**	1.97 a±0.34	1.45 b±0.19	1.79 b±0.31	2.35 ab±0.17	3.22 a±1.12	2.06 bc±0.25
T33		**3 (57.99<)**	2.57 a±0.32	2.19 ab±0.01	5.85 a±1.60	1.94 b±0.23	1.99 a±0.09	3.13 bc±0.41

a-b values within a column with different superscripts was differ significantly (P < 0.05).

with a value of 6769.3 g in ducks hatched from heavy eggs, compared to other ducks hatched from light and medium eggs (P=0.010). Yılmaz et al. (2008) found that storage time and hatching egg weight did not significantly affect cumulative feed consumption during the trial period.

3.1.3 Effect of treatments on daily weight gain

Effect of treatments on daily weight gain Table 4 was shown that there were significant effects of treatments on daily weight gain, even though there was refluxing in the highest weight gain between treatments at different ages. However, ducks from T22 at (1-7 and 36-42) days, T12 at (8-14) days, T11 and T21 at (15-21) days, and T33 at (22-28) days had significantly higher weight gain. Moreover, Weight gain in Table 3 was shown that there were significant effects of egg storage on duck's weight gain at periods (8-14, 15-14, and 36-42) day-old, the duck from medium eggs in storage 1 had significantly higher weight gain than ducks from the medium egg in storage 2 at (8-14) day-old; ducks from large and small eggs in storage 3 had significantly lower weight gain than ducks from large and small eggs in storage 2 and 3 at (15-14) day-old; in contrast, at (35-42) day-old ducks from medium eggs in storage 2 and large eggs in storage 3, and small eggs from storage 3 were significantly higher weight gain than ducks from medium eggs in storage 1, and ducks from large eggs in storage 1 and small egg in storage 1 respectively. The weight gain obtained from ducks in different treatments was not regular at different ages was also found by Yılmaz et al. (2008). Yılmaz et al. (2008) found that although the differences in hatching egg weight groups in terms of hatching weight were significant, no significant effect of storage time on live weight gain in ducks at the beginning of the trial (1st week) was observed. In general, live weight gain was highest in weeks 5 and 7, and differences between groups were found to be significant in weeks 5, 7, and 9. In ducks hatched from eggs of different durations and different weights, live weight gains gradually decreased after 9 weeks of age. İpek and Sözcü [11] Effect of egg weight on duck weight gain was found by that significantly higher in large eggs compared with medium and small eggs at periods 1-7, 7-14, and 21-28days- old, they were also found that in 14-21 and 28-35 and 35-42days the differences not significant in addition the weight gain negatively decreased in periods 28-35 and 35-42 day in medium and small eggs. While at 35-42 days the weight gain returns to increase.

3.1.4 Effect of treatments on duck feed conversion ratio at different ages

The treatment effect on the feed conversion ratio in Table 5 was significant at all ages except at ages (1-7 and 29-35) day-old. Because of variations in feed intake and weight gain at different ages, the feed conversion ratio also vibrated, ducks from T23 at (8-14) days, T33 at (15-21) days, T21 and TT23 at (22-28) days and T13 at (36-42) had significantly and numerically lower feed conversion ratio. At 1-7 and 29-35 day age old there were no significant differences between the same egg weight in different storages. At 15–21-day old ducks from small eggs in storage, 1 significantly had a better feed conversion ratio compared with ducks from small eggs in storage 3; in addition, the ducks from large eggs in storage 3 significantly had a lower feed conversion ratio compared with ducks from the large egg in storage 1; ducks from small eggs in T23 and T33 were significantly better than ducks from large eggs in T13 at age 36-42 day. The founding in contrast with Sugiharto, et al. [27] and Yılmaz et al. (2008) that there were no significant effects of egg storage and egg weight on feed conversation ratio. The effect of egg weight on the feed conversion ratio was observed at age 36–42-day-old ducks from medium eggs were significantly better than the feed conversion ratio in small eggs. These results might be due to the environmental factors' effect on the feed conversion ratio [43,44]. Duman and Şekeroğlu [45] found no significant effect of egg weight on feed conversion ratio during ages 0-21, 21-39 a, and 0-39 days old. Results by Petek et al. [46]; Witt de and Schwalbach [47]; Ulmer-Franco et al. [38] Egbeyale et al. [48] also found feed conversion ratio did not affect by egg weight. Generally, the data not being regular might be due to the different ratios of males to females in the treatments. Whereat Idahor et al. [49] described that male ducks have more than 50g and 60g egg weight and the male increased as the egg weight increased while the female not increased by following that pattern. In addition, Chia and Momoh [50] reported that the weight of males was heavier than females, as well as Phuoc et al. [37] males weigh twice of females. the data in the current research was similar to the finding of the negative effect of egg storage on researchers (13, 15, 44, 57) on feed conversion ratio was found [51-61].

4. CONCLUSION

egg storage and egg weight significantly affect local ducks performances. As the duration of storage longer the feed conversion ratio decreased. According to egg weight, the small egg in each storage had a lower feed conversion ratio.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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