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Research Article

Effect of Sex and Day-Old Weight on Subsequent Body Weight and Body Mass Index in Commercial Broilers

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Abstract | It is important to study the effect of sex and day-old weight on subsequent weight and body mass index. This study was conducted during the period from 15/10 to 27/11/2017. A total of 79 broiler chicks (Ross 308) (35 male and 44 female) cut was used. Results revealed that the effect of sex was not significant on the body weight of birds at the first, second, third, fourth weeks, whereas the effect was significant (*P< 0.05*) on the body weight at 5th week (1648.28 g in males vs 1534.97 g in females). In regards with the effect of the day-old weight the effect was significant (*P<0.05*) on the body weight for all the five weeks. The body weight of chicks with the highest day-old weight showed the highest body weight at 4th and 5th weeks. Also, the results showed that the effect of sex was not significant on the body mass index (BMI) at the first, second, third, and fourth weeks, while the effect was significant (*P<0.05*) at the 5th week. The effect of the day-old weight was significant (*P<0.05*) on the BMI at the 1st , 2nd and 5th weeks. In conclusion: The two studied factors should be taken in our consideration to increase the production and then increase the profitability of broiler projects.

Keywords | Broiler, Body mass index, Body weight, Day-old weight, Sex

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INTRODUCTION

The increasing of the reproductive efficiency is of great importance in the poultry industry. As the required growing period of broilers has been shortened genetically, the effect of egg and chick weights on the growth performance of broiler is becoming more pronounced and could be very important in commercial broiler projects (Tahir et al., 2011). For instance, Cunningham (2009) reported that the mean period needed for the chicks to reach 2 kg body weight is 60.79 day in 1980 while the same weight in 2000 took about 40.86 day. The crossbreeding has been used to increase the growth rate however, rapidgrowth has been associated with some negative consequences, such as an increase in fat deposition (Griffin, 1996; Zerehadran et al., 2004).Increased fat content may be undesired in meat products and this can be prevented with decreased BMI (Mendeş et al., 2008).

The day-old weight reflects the egg weight as there is a high genetic correlation between the two traits (Strong et al.,1978; Marks, 1983). Moreover, the chick weight at first day has a significant effect on mortality at first day (Skewes et al.,1988) and the performance through later stages of broiler age (Morris et al.,1968; Al-Murrani, 1978). Increasing the egg number hatchability by genetic selection led to reduce the egg weight and then decrease day-old chick weight (Shanawany, 1984; Yannakopoulos and Tservent-Goust, 1987). There is no agreement among different studies concerning the effect of the day-old weight on subsequent weight. Some studies reported that the day-old weight affect the performance of broilers

(Al-Murrani,1 978; Whiting and PestiI, 1984; Mafeni et al., 1986), while other studies have demonstrated that the differences in day-old weight has a little effect on the performance of broilers (Morris et al., 1968; Pinchasov, 1991; Jiang and Yang, 2007).The objective of the present study was to determine the effect of day-old weight and sex on body weight and BMI during the five weeks in commercial broilers.

MATERIALS AND METHODS

A total of 79 broiler chicks (Ross 308) (35 male and 44 female) were reared in the poultry farm of the College of Agriculture/ University of Baghdad during the period from 15/10 to 27/11/2017. The chickens were numbered in wings by metallic numbers. The drinking water was provided to birds and they fed *ad libitum*. The age of naturalization was identifying at the end of experiment. The composition of the diet is shown in the Table (1).

Table 1: Composition and calculated analysis of the experimental broiler diet

Ingredients	Starter 1-10 day	Growth 11-24 day	Finisher 25-35 day
Corn meal	10.1	12	16.5
Wheat	50	50	50
Soybean meal 48 c.p	30	26	21.4
concentrated protein(1)	5	5	5
Sunflower oil	2.9	5.2	5.3
Calcium carbonate	0.9	0.9	0.9
Dicalcium phosphate	0.7	0.5	0.5
Sodium chloride	0.2	0.2	0.2
Mineral-vitamin-premix	0.2	0.2	0.2
Total	100	100	100
Calculated chemical analysis			
CP%	23	21.25	19.4
ME (kcal/kg)	3003	3153	3200
L-Lysine %	1.26	1.1	1.0
DL-Methionine %	0.48	0.45	0.43
Cysteine%	0.36	0.34	0.31
Methionine + Cyst %	0.84	0.796	0.74
Arginine%	1.28	1.15	1
Ca %	0.85	0.80	0.78
Av. Phosphorus %	0.43	0.40	0.40

1) The concentrated protein type Brocon-5 special W contain the following per kg: 20% crude protein, 5% fat, 2.2% fiber, 4.2% Ca, 4.68% P, 3.85% Lysine, 3.7% Methionine, 4.12 Methionine+Cystine, 2.5% Na, 2107 ME (kcal/kg), 2000 IU vit A, 4000 IU votD$_3$, 500 mg vit E, 30 mg vit K$_3$, 15 mg vit B$_1$, 140 mg vit B$_2$, 20 mg B$_6$, 10 mg Folic acid, 100 µg Biotin, 1 mg Fe, 100 mg Cu, 1.2 mg Mn, 800 mg Zn, 15 mg I, 2 mg Se, 6 mg Co,900 mg Antioxident.

Statistical Analysis

Data were subjected to a GLM model in SAS software (Version 9.1). The sex and day-old chick groups as fixed effects, according to the following model:

$$Y_{ijk}=\mu+ W_i + S_j + e_{ijk}$$

Where Y is the dependent variable, µ the population mean, W the day-old chick weight effect, S the sex effect, and e the random error. Significant differences among means of different groups were indicated at $P<0.05$ with the least significant difference test. BMI was calculated using the following equation:

$$BMI= Weight(g)/Body\ length(cm^2)$$

RESULTS AND DISCUSSION

Results presented in the Table (2) showed that the effect of sex on the body weight (BW) was not significant in the first, second, third, and fourth weeks, while the effect was significant ($P<0.05$) in the five -week as the males body weight (1648.28 g) was significantly higher than the body weight of females (1534.97 g).

The effect of day-old weight on subsequent weights was significant ($P<0.05$) for all periods (Table 3). The chicks with the highest day-old weight have the highest weight as compared with other groups. The difference in BW between the highest and other groups is becoming more pronounced at 4th and 5th week. The results of the current study agreed with several studies who confirmed the important role of the day-old weight on the performance of broilers (Morris et al., 1968; Al-Murrani, 1978; Mafeni et al., 1986). Similar results were also obtained by Hartmann et al. (2003) in the Wight Leghorn. On the other hand, some researchers have found that the advantage of chick weight at hatch decreased rapidly after hatching (Gupta and Johar, 1975; Pinchasov, 1991). The non-significant effect of day-old weight was also reported by Jiang and Yang, (2007) who stated that although the small group showed a little lower body weight in subsequent growing period as compared with the large and moderate group, the differences were not significant and then concluded that the day-old chick weight did not affect the growth and carcass performances at market age.

The effect of sex of chick was significant only on the BMI at 5th week (Table 4) as the BMI of males (0.67) was higher than that of females (0.63). These results agreed with results obtained by Mendeş et al. (2008). The results also, demonstrated that the effect of the day-old weight on the BMI was significant at the BMI of the first, third and fifth weeks (Table 5). These results indicated that heavy birds

Table 2: The effect of sex on subsequent body weight in broilers (Ross 308)

Group	1st Week	2nd Week	3rd Week	4th Week	5th Week
Male	163.62±3.04	415.55±6.53	774.10±13.51	1242.58±26.64	1648.28±33.93
female	157.79±3.55	398.71±6.80	744.61±15.16	1212.03±26.26	1534.97±36.71
	NS	NS	NS	NS	<0.05

Table 3: The effect of the day-old weight category on subsequent body weight in broilers (Ross 308)

Weight/g	1st Week	2nd Week	3rd Week	4th Week	5th Week
<39	149.76±4.74b	383.29±11.17b	712.58±26.28b	1181.88±47.27b	1521.12±67.00b
39-42	161.85±4.35a	403.33±6.37ab	745.14±14.65ab	1215.41±24.05b	1535.26±33.55b
>42	165.22±3.12a	421.80±7.14a	793.45±13.62a	1278.97±29.85a	1670.97±37.18a

Means with a different letter in the same column significantly different (P<0.05)

Table 4: The effect of sex on subsequent BMI in broilers (Ross 308)

Group	1st Week BMI1	2nd Week BMI	3rd Week BMI	4th Week BMI	5th Week BMI
Male	0.41±0.01	0.46±0.01	0.48±0.03	0.59±0.01	0.67±0.01
female	0.40±0.01	0.44±0.01	0.47±0.02	0.58±0.02	0.63±0.01
	NS	NS	NS	NS	<0.05

Table 5: The effect of the day-old weight category on subsequent BMI in broilers (Ross 308)

Weight/g	1st Week BMI1	2nd Week BMI	3rd Week BMI	4th Week BMI	5th Week BMI
<39	0.37±0.02b	0.42±0.01	0.45±0.01b	0.58±0.01	0.62±0.02b
39-42	0.41±0.01ab	0.45±0.01	0.48±0.008a	0.59±0.01	0.64±0.01ab
>42	0.44±0.01a	0.46±0.01	0.48±0.01a	0.60±0.01	0.66±0.01a

Means with a different letter in the same column significantly different (P<0.05)

Table 6: The correlation coefficients between body weight and body mass index in broilers (Ross 308)

	1st Week	2nd Week	3rd Week	4th Week	5th Week
1st Week BMI	0.67**	0.19	0.14	0.05	0.03
2nd Week BMI	0.30**	0.57**	0.39**	0.26*	0.29**
3rd Week BMI	0.31**	0.53**	0.87**	0.62**	0.56**
4th Week BMI	0.19	0.32**	0.48**	0.65**	0.53**
5th WeekBMI	0.14	0.37**	0.34**	0.42**	0.82**

*(P<0.05)
**(P<0.01)

tend to have higher BMI values and fat percentage, with *ad libitum* feeding. Similar results were found by Mendeş et al. (2008) who reported that "BMI could be used as one of the indicators for body fat in broiler (Ross 308).

The correlation coefficients between body weight and BMI are shown in Table (6). Most of the estimations are significant. The highest estimations were found when the weight and BMI for the same week.

CONCLUSIONS

The costs can be reduced by culling the low weight chicks and allow to avoid the high costs of feeding and maintenance.

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CONFLICT OF INTEREST

None of the authors have any conflict of interest to declare.

AUTHORS CONTRIBUTION

All authors contributed equally.

REFERENCES

- Al-Murrani WK (1978). Maternal effects on embryonic and post-embryonic growth in poultry. Br. Poult. Sci. 19: 277-281. https://doi.org/10.1080/00071667808416476
- Cunningham DL (2009). Cash flow estimates for contract broiler production in Georgia: A 20-year analysis. Bulletin. 1228:1-10.
- Griffin HD (1996). Understanding genetic variation in fatness in chickens. Annual report. Roslin Institute, Edinburgh.
- Gupta ND, Johar KS (1975). Early body weight of five strains of White Leghorn. Br. Poult. Sci. 16: 593-598. https://doi.org/10.1080/00071667508416234
- Hartmann C, Strandberg E, Rydhmer L, Johansson K (2003). Genetic relations of yolk proportion and chick weight with production traits in a White Leghorn line. Br. Poult. Sci. 44: 186-191. https://doi.org/10.1080/0007166031000096489
- Jiang RS, Yang N (2007). Effect of day-old body weight on subsequent growth, carcass performances and levels of growth-related hormones in quality meat-type chicken. Arch.Geflügelk.71(2) S: 93–96.
- Mafeni M, Tivzenda PT, Briles CO, Lawrence L (1986).The response of egg size on early growth in white Plymouth Rock chickens. Poult. Sci. 65(85) (suppl. 1).
- Marks HL (1991). Divergent selection for growth in Japanese quail under split and complete nutritional environments 4. Genetic and correlated responses from generations 12-20. Poult. Sci. 70: 453-462. https://doi.org/10.3382/ps.0700453
- Mendeş M, Pala A, Dincer E (2008). Body mass index slopes of growth and fat content under different feed restrictions in broiler chickens. Arch. Geflügelk. 72 (1). S: 41–45
- Morris RH, Hessels DF, Bishop RJ (1968). The relationship between hatching egg weight and subsequent performance of broiler chickens. Br. Poult. Sci. 9: 305–315. https://doi.org/10.1080/00071666808415726
- Morris RH, Hessel DF, Bishop RJ (1968). The relationship between hatching egg weight and subsequent performance of broiler chickens. Br. Poult. Sci. 5: 305-315. https://doi.org/10.1080/00071666808415726
- Pinchasov Y (1991). Relationship between the weight of hatching eggs and subsequent early performance of broiler chicks. Br. Poult. Sci. 32: 109-115. https://doi.org/10.1080/00071669108417332
- Shanawany MM (1984). Inter-relationship between egg weight, parental age and embryonic development. Br. Poult. Sci. 25: 449-455. https://doi.org/10.1080/00071668408454886
- Skewes PA, Wilson HR, Mather FB (1988). Correlations among egg weight, chick weight and yolk sac weight in Bobwhite quail *(Calinus virginianus)*. Florida Sci. 51: 159-162.
- Strong CF, Nestor Jr, KE, Bacon WL (1978). Inheritance of egg production, egg weight, body weight and certain plasma constituents in coturnix. Poult. Sci. 57: 1-9. https://doi.org/10.3382/ps.0570001
- Tahir M, Cervantes H, Farmer CW, Shim MY, Pesti GM (2011). Broiler performance, hatching egg, and age relationships of progeny from standard and dwarf broiler dams. Poult. Sci. 90: 1364–1370. https://doi.org/10.3382/ps.2010-01165
- Whiting TM, Pesti GM (1984). Broiler performance and hatching egg weight relationship of progeny from standard and dwarf broiler dams. Poult. Sci. 63:425–429. https://doi.org/10.3382/ps.0630425
- Wilson HR (1991). Interrelationships of egg size, chick size, post-hatching growth and hatchability. World's Poult. Sci. J. 47: 5-20. https://doi.org/10.1079/WPS19910002
- Yannakopoulos AL, Tserveni-Goust AS (1987). Relationship of parent's age, hatching egg weight, and shell quality to day-old chick weight as influenced by oviposition time. Poult. Sci. 66:829-833. https://doi.org/10.3382/ps.0660829
- Zerehdaran S, Vereijken ALJ, Vanarendonk JAM, Vanderwaaij EH (2004). Estimation of genetic parameters for fat deposition and carcass traits in broilers. Poult. Sci. 83: 521-525. https://doi.org/10.1093/ps/83.4.521