European Journal of Agricultural and Rural Education (EJARE)
Available Online at: https://www.scholarzest.com
Vol. 4 No.05, May 2023
ISSN: 2660-5643

THE EFFECT OF GENETIC LINE AND GENDER ON THE BODY WEIGHT AND CARCASS COMPONENTS BY USING JAPANESE QUAIL

Ismail Younis AL-Hadeedy[1*]
1) Animal production department, College of agriculture, Kirkuk university, Kirkuk, Iraq
*) Corresponding author e-mail: ismail.younis@uokirkuk.edu.iq

Article history:

Received: 21st March 2023
Accepted: 28th April 2023
Published: 30th May 2023

Abstract:

This experiment was done in the Poultry farm, Animal Production Department, College of Agriculture, Kirkuk University, form 2 April until 31 July 2022 to determine the effect of genetic line of three varieties of Japanese quail (White, Brown and Grey) and gender on the body weight and carcass components, 300 unsexed quail chick one day old were used placed in vertical battery cages for four weeks old then the birds were slaughtered and measured the parts weight. The results of the statistical analysis indicated that the brown Japanese quail superiority white Japanese quail in carcass weight, back and wings, while no significant differences between three varieties of Japanese quail in for body weight, chest, heart and gizzard. females of Japanese quail were superiority to males in body weight, carcass, chest, wings, liver and gizzard, while male's superiority females in back weight and heart, while no significant differences were observed between males and females in thigh weight. The results also indicated the superiority of brown female's Japanese quail in weight of carcass, breast, thigh, wings, gizzard and liver compared with other of effects. We concluded from this study the importance of raising brown Japanese quail to obtain meat due to the good productive performance compared with other varieties.

Keywords: genetic line, gender, body weight, carcass, Japanese quail.

INTRODUCTION:

Poultry birds are considered an important source for providing the human need for animal protein and a means to achieve food security for many societies as well as providing a source of national income for the economies of many countries due to the short production cycle and high food conversion ratio compared to other types of farm animals (Hassan, 2011). With the increased demand for meat and the diversity of production sources in the poultry industry, Japanese quail quickly occupied its position in this industry as a source of consumer favorite meat at cheap prices compared to other poultry species (Adeola, 2006; Zofia et al., 2006). China is the world's largest producer of Japanese quail meat, as the number of birds that are slaughtered annually is estimated at 1.360 million birds, with an average carcass weight of 200 grams (Tavaniello, 2013). Domestic quails weigh about 100 to 140 g at the age of genderual puberty however there are commercial meat-producing breeds weighing up to 300 g (Minvielle, 2004). The plumage color of wild quail is mainly dark brown but the domestication of Japanese quail and selection processes have led to the appearance of many varieties of different colors (Tavaniello, 2013). Several studies were conducted on Japanese quail in Iraq to study the productive performance of meat. In a study conducted by Hassan et al. (2013) they indicated that the live body weight and Slaughter ratio of Japanese quail birds at 6 weeks of age amounted to 168.44 g and 65.65%, respectively. Hassan et al. (2015) also mentioned that the best age for marketing Japanese quail is 6 weeks, as no significant difference in live body weight was observed for ages 6, 8 and 10 weeks. In a study conducted by Zayed et al. (2000), they indicated that there were significant differences in body weight between varieties of brown and white quail, and attributed this to the influence of genetic factors in determining body weight. While Attia (2006) indicated in his study on the varieties of white and brown Japanese quail that the body weight at the age of 2, 4 and 6 weeks for the Japanese brown quail was 59.46, 122.53 and 171.15 g, respectively, while the average live body weight of white quail at the same age was 57.53 and 114.12 and 167.11 g, respectively. Abdul Sattar (2016) concluded in his study to evaluate the productive performance of three varieties of white, black and brown Japanese quail that the body weight at the age of 6 weeks was 175.03, 187.62 and 182.91 g, respectively, and also concluded that the Slaughter ratio at the same age was 65.87 and 66 .06 and 69.09 % respectively. In a study

conducted by Othman and Abdul Rahman (2017) they indicated exceed of brown Japanese quail over black in carcass weight at 6 weeks of age, which amounted to 155.07 and 131.52 g, respectively, while Walid (2020) concluded in his study to evaluate productive performance for varieties of brown, black and white Japanese quail, the brown and black Japanese quail outperformed the white Japanese quail in carcass weight amounted 128.74, 127.33 and 122.25 g, respectively, while it was concluded that there were no significant differences between the different varieties in ratio of breast weight. In view of the importance and ease of raising Japanese quail for the purpose of obtaining animal protein, this study was conducted

MATERIALS AND METHODS:

The experiment was done in the poultry farm, Animal Production Department, College of Agriculture, Kirkuk University, form 2 April until 31 July 2022. Unsexed 300 quail chick one day old were used to study the effect of three genetic lines of Japanese quail (white, brown and grey) and Gender (male and female) on the body weight and carcass parts weight, the birds placed in vertical battery cages, each battery contains 5 floors and each floor containing 3 cages with dimensions of one cage (30 x 25 x 35 cm) length, width and height respectively, water and fed were *ad libitum* and lighting hours was 16 h/day duration of experiment using 60-watt lamps, They were bred for 16 weeks and given the diet shown in table 1 below, At the end of experiment the birds were slaughtered and electric balance with 0.001 g sensitivity was used to measure the carcass weight (g), chest (g), thigh (g), back (g), wings (g), heart (g), liver (g) and gizzard (g).

STATISTICAL ANALYSIS

All data were analyzed using the GLM procedure of SAS software (SAS, 2004) for analysis of variance as completely randomized design (CRD). Significant difference among treatments means were tested by applying Duncan's multiple range test (Duncan, 1955).

Table 1: The experiment diet

period **Feed stuff (%)**	**Starter** **(1-2 weeks)**	**Production** **(3-4 weeks)**
Yellow corn	56.1	55.6
Soybean meal	37	27
Wheat	0	5
Sunflower oil	0.2	1.3
Vitamins and Minerals*	5	5
Limestone	1.4	5.6
Di-calcium phosphate	0	0.2
Salt	0.3	0.3
Total	**100**	**100**
Chemical calculated analysis**		
Crude Protein (CP)	24.16	20.02
Metabolism Energy (kcal/kg)	2906.18	2900.43
Fibers (%)	2.82	2.57
Lysine (%)	1.43	1.15
Methionine (%)	0.49	0.43
Ava. Calcium (%)	0.81	2.43
Ava. Phosphor (%)	0.36	0.38
Arginine (%)	1.62	1.29

*MIAVIT company

**According to NRC, (1994).

RESULTS AND DISCUSSION:

Table 2 below shows the effect of three varieties of Japanese quail (white, brown and gray) and gender on body and carcass weight. The table indicate that there were no significant differences (P≤0.05) between the three varieties of quail in body weight, while the brown outperformed the white in carcass weight reached 109.68 and 104.13 g, respectively, while they did no differences significantly with grey quail.With regard to the effect of gender, the table shows that females were significantly (P≤0.05) increase to males in body weight reached 179.27 and 169.34 g respectively. Females also outperformed males significantly (P≤0.05) in carcass weight reached 110.12 and 104.50 g. respectively, As for the interaction between three quail varieties with the gender, we notice that there are no significant differences in body weight, while the brown females quail were significantly increase (P≤0.05) to the white males and grey males in carcass weight reached 32.66, 29.60 and 30.29 g respectively, while it not differences significantly with white females, grey females and brown males Japanese quail.

Table 2: Effect of genetic line and gender on the body weight and Slaughter weight

Traits Factors	**Body weight (g)**		**carcass weight (g)**	
Effect of line	Mean	S. D.	Mean	S. D.
White line	171.21 a	18.10	104.13 b	9.75
Brawn line	177.49 a	27.11	109.68 a	14.77
Gray line	170.40 a	25.36	105.64 ab	14.30
Effect of Gender				
Male	169.34 b	24.19	104.50 b	11.77
Female	179.27 a	23.32	110.12 a	15.44
Effect of Line * Gender				
White * Male	167.65 a	19.38	29.60 c	3.21
White * Female	175.53 a	15.85	30.93 abc	3.16
Brawn * Male	174.35 a	27.87	30.83 abc	3.59
Brawn * Female	182.35 a	25.83	32.66 a	4.71
Gray * Male	166.49 a	23.60	30.29 bc	3.65
Gray * Female	179.82 a	27.66	32.06 ab	7.55

Values followed with the same letters are not significantly difference from each other while the different letters are significantly difference according to Duncan's Multiple Range test at (5%) level.

These results agreed with the findings of Mizutani (2003); Abdel Azeem (2001) and Thear (2001) who indicated that there are significant differences in productive performance within same breed and this is due to the degree of its purity as well as to the genetic susceptibility which Including gender and weight at hatching, where there is a positive and highly significant genetic correlation between weight at hatching, live weight, and carcass weight. Numerous studies reported reduction in the male body weight appeared at the beginning of puberty compared with females may be result due to competition among males for social hierarchy which cause reduction in their body weight because of the excess of fighting activity and reduction of time of feeding, this situation appear obviously in low protein level diet, and that may explain the superiority of body weight of birds in standard crude protein level compared with low crude protein level (Hassan & Fadhil, 2019). Also Sakomura and Rostagno, (2016) reported that the body growth is determined by the body crude protein, fat, ash, and water deposition. The potential for growth and body chemistry deposition can vary depending on strains, gender, and stage of growth. The growth curves expressing the development of birds under specific conditions can be divided into ascending, plateau, and descending, following a sigmoid growth curve.

Table 3 shows the effect of the three varieties of Japanese quail (white, brown and grey) and gender on parts of carcass weight including chest (g), thigh (g), back (g) and wings (g). The table appointed that there are no significant differences (P≤0.05) between three varieties of quail in breast weight (g), while brown quail was significantly increased (P≤0.05) to grey and white in thigh weight (g) reached 19.71, 18.63, and 17.49 g, respectively, but grey quail was significantly increased (P≤0.05) to white in thigh weight (g) reached 18.63 and 17.49 g respectively .While brown quail was significantly increased (P≤0.05) to white quail in back weight (g) reached 15.33 and 13.63 g, respectively, but it no differences significantly (P≤0.05) with grey quail. As for the weight of wings (g), brown quail was significantly increased (P≤0.05) over white and gray reaching 5.21, 4.72 and 4.86 g respectively. As for the effect of gender it is noticed from above table that there are no significant differences (P≤0.05) for both genders in thigh weight (g), while females outperformed males significantly (P≤0.05) in breast and wings weight reached 31.89 and 30.30 g for chest weight (g) and 5.24 and 4.76 g for wings weight (g), while males were significantly increased to females (P≤0.05) in back weight reached 15.29 and 13.33 g. About the effect of interaction between three varieties of quail (white, brown and grey) and gender, we noticed from the table that brown female Japanese quail were significantly (P≤0.05) increased to white males in breast weight reached 32.66 and 29.60 g respectively while they were no significantly differences with other factors. About thigh weight, brown females Japanese quail outperformed white males and females and grey female Japanese reached 20.15, 17.24, 17.24, and 18.09 g respectively, while no significantly differences with other factors. As for back weight, brown males significantly increased (P≤0.05) on white males and females quail and brown and grey females reached 16.25, 14.16, 12.98, 13.91 and 13.04 g respectively, while it not significantly differences with grey male.

Table 3: Effect of genetic line and gender on parts of the carcass weight (g)

Traits Factors	Chest (g)		Thigh (g)		Back (g)		Wing (g)	
Effect of line	Mean	SD	Mean	SD	Mean	SD	Mean	SD
White line	30.20 a	3.22	17.49 c	1.81	13.63 b	1.87	4.72 b	0.69
Brawn line	31.54 a	4.12	19.71 a	2.53	15.33 a	2.83	5.21 a	0.83
Gray line	30.81 a	5.10	18.63 b	2.68	14.56 ab	2.59	4.86 b	0.79
Effect of Gender								
Male	30.30 b	3.52	18.65 a	2.20	15.29 a	2.39	4.76 b	0.73
Female	31.89 a	5.30	18.72 a	3.08	13.33 b	2.42	5.24 a	0.83
Effect of Line * Gender								
White * Male	29.60 b	3.21	17.24 d	1.87	14.16 bc	1.95	4.41 c	0.55
White * Female	30.93 ab	3.16	17.79 cd	1.74	12.98 c	1.57	5.09 ab	0.68
Brawn * Male	30.83 ab	3.59	19.42 ab	2.56	16.25 a	2.71	5.13 a	0.91
Brawn * Female	32.66 a	4.71	20.15 a	2.48	13.91 bc	2.43	5.33 a	0.70
Gray * Male	30.29 ab	3.65	18.85 abc	1.70	15.19 ab	2.08	4.67 bc	0.53
Gray * Female	32.06 ab	7.55	18.09 bcd	4.23	13.04 c	3.12	5.31 a	1.11

Values followed with the same letters are not significantly difference from each other while the different letters are significantly difference according to Duncan's Multiple Range test at (5%) level.

As for the weight of wings, brown males and females of Japanese quail and gray females of Japanese quail were significantly increased (P≤0.05) to males of white and gray quail reaching 5.13, 5.33, 5.31, 4.41 and 4.67 g, respectively while it not significantly differences with white female. These results agreed with the found by Jasim et al. (2006) and Lewozuk et al. (1980) who indicated that there were significant differences in the rates of carcass weights between different varieties of Japanese quail and these differences were due to superiority of varieties in body weights resulting from highly and significant correlation coefficient between live body weight and carcass weight. Alkan et al., (2010) indicated that positive correlations were determined between the body weight and carcass weight, breast percent, there were found positive correlations between the body weight and wing percent. also, there was found positive correlation between the breast percent and all other carcass percent traits of body weight , while no significantly negative or positive relationship was found between body weight and thigh percent of body weight.

Table 4 shows the effect of three varieties of Japanese quail (white, brown, and grey) and gender on the weight of edible internal viscera. The table indicated that there were no significant differences (P≤0.05) between three varieties of Japanese quail in heart weight and gizzard, while white Japanese quail increased compared with grey quail in liver weight amounted 3.36 and 3.01 g respectively, which did not significantly difference with brown Japanese quail.

Tale 4: Effect of genetic line and gender on the Edible internal viscera

Traits Factors	Heart (g)		Liver (g)		Gizzard (g)	
Effect of line	Mean	SD	Mean	SD	Mean	SD
White line	1.16 a	0.15	3.36 a	1.35	3.27 a	0.83
Brawn line	1.18 a	0.25	3.26 ab	1.33	3.09 a	0.52
Gray line	1.20 a	0.20	3.01 b	1.23	3.06 a	0.67
Effect of Gender						
Male	1.26 a	0.18	2.36 b	0.50	2.80 b	0.46
Female	1.05 b	0.18	4.61 a	0.97	3.68 a	0.63
Effect of Line * Gender						
White * Male	1.25 a	0.11	2.25 c	0.43	2.82 b	0.62
White * Female	1.06 b	0.13	4.71 a	0.65	3.83 a	0.72
Brawn * Male	1.27 a	0.23	2.42 c	0.48	2.88 b	0.35

Brawn * Female	1.03 b	0.20	4.56 b	1.19	3.41 a	0.59
Gray * Male	1.25 a	0.18	2.37 c	0.55	2.73 b	0.43
Gray * Female	1.07 b	0.20	4.54 a	1.04	3.83 a	0.49

Values followed with the same letters are not significantly difference from each other while the different letters are significantly difference according to Duncan's Multiple Range test at (5%) level.

As for the effect of gender, the table above shown that males outperformed females significantly (P≤0.05) in heart weight reached 1.26 and 1.05 g respectively, while females outperformed males significantly (P≤0.05) in liver weight reached 4.61 and 2.36 g respectively, females also outperform males in gizzard weight reached 3.68 and 2.80 g respectively. About the interaction between three varieties of Japanese quail and gender, it is noted from the table that males of white, brown and grey Japanese quail were significantly increased (P≤0.05) compared with females of white, brown and grey reached 1.25, 1.27, 1.25, 1.06, 1.03 and 1.07 g respectively. As for the weight of liver, it is noted from the table that females of white and grey quail were significantly increased (P≤0.05) to males of white, brown and grey quail and females of brown reached 4.71, 4.54, 2.25, 2.42, 2.37 and 4.56 g respectively, also females of brown quail were significantly (P≤0.05) superior to the males of white, brown and gray quail reached 4.56, 2.25, 2.42 and 2.37 g, respectively. About the weight of the gizzard, it appears from above table that females of white, brown and grey were significantly superior (P≤0.05) to males of white, brown and grey reached 3.83, 3.41, 3.83, 2.82, 2.88 and 2.73 g respectively. These results agreed with the findings of Al-Hajo et al. (2012) who indicated that there were differences in weights of edible internal viscera between varieties of Japanese quail. These differences duo to genetic susceptibility including gender, variety, feather differences, egg weight, or hatching weight (Ozbey and Ozceli,; 2004). Rudik et al., (2021) observed that the weight of the liver in female quail is higher than that of males due to hormonal differences between the sexes. In females, estrogen hormones are produced in greater quantities, which lead to increased growth of fatty tissue in the liver. Thus, the liver becomes larger and heavier in females than in males. In addition, the difference in liver weight between the sexes could be due to differences in liver function between males and females. For example, the liver is responsible for the production of some proteins associated with the digestive system, which differ in types and quantities between the sexes. Therefore, sex differences in liver function may contribute to increased liver weight in females compared to males.

CONCLUSION:

We concluded from this study that the brown Japanese quail was better than white and grey in most of performance traits, carcass cuts and edible internal viscera so it was importance of raising brown Japanese quail to obtain meat due to the good productive performance compared with other varieties.

REFERENCES:

1. Abdel- Azeem, F., Ibrahim, F.A., Ali, N.G. 2001, Growth performance and some blood parameters of growth Japanese Quail as influenced by different protein level and microbial probiotics supplementation. Egypt Poult. Sci., 21: 465 – 489.
2. Abdul Sattar, Ali Rafee. 2016. Study of the productive performance of three varieties of Japanese quail during the fall and spring seasons in Iraq. Master's thesis, College of Agriculture, Diyala University.
3. Adeola, O. 2006. Review of research in duck nutrient Utilization. Mt1. J. Poult. Sci. 5: 210 – 218.
4. Al -Hajo, N. N. Abdul, A. J. Hussein, B. S. Rasul. N., S. Abdul Hussein, A. I. Abbas. 2012, the effect of removing the chronological gland and gender on some qualitative and sensory properties of meat quail birds. journal of Iraqi Poultry Science. 6 (2): 12-21.
5. Alkan S., Kemal Karabağ, Aşkın Galiç, Taki Karsli and Murat Soner Balcioğlu. 2010. Determination of Body Weight and Some Carcass Traits in Japanese Quails (Coturnix coturnix japonica) of Different Lines. Kafkas Univ Vet Fak Derg, 16 (2): 277-280.
6. Attia, Y. M. 2006. Comparison of two strains of Japanese brown and white Samoa bird in the productive and immunological indicators and the qualitative and chemical characteristics of eggs. Master Thesis, College of Agriculture, University of Baghdad.
7. Duncan's, B.D. (1955). Multiple Range and Multiple F-test. Biometrics, 11: 1-42.
8. Hassan K. Hamid .2013. Evaluation of productivity performance of Japanese quail during the summer. Diyala Journal of Agricultural Sciences 5(2):69-80.
9. Hassan, K. Hamid, A. R. Abd–Alsattar, H. A. Yassen, H. T. Abed and D. A. Abdul Wahab. 2015. Effect of Varieties, Age and Gender in Some Productive Traits in Japanese Quail in Iraq. American Journal of Bio Science, 3(2): 55-58. doi: 10.11648/j.ajbio.20150302.15
10. Hassan, Khaled Hamed. 2011. Breeding and improving domestic birds. Diyala University Press. Republic of Iraq.
11. Hassan KH, Fadhil MA (2019). Genetic selection for body weight in japanese quail (coturnix coturnix japonica) under different nutritional environments. Adv. Anim. Vet. Sci. 7(7): 526-529.
12. Jassim, J. M.., M., R. Kazem, A., M. Hassan. 2006, The effect of genetic composition and gender in the productive qualities of two lines of quail birds. Basra journal of Agricultural Sciences: (1) 1950-37.
13. Lewozuk, A., Bochno, R., Michalika, D. 1980, The suitability of body weight and some carcass traits as predictors of the contact of meat bone, and fat in duck. Car Cass Anim. Breed. Abst. 48:27-62.

14. Minvielle F. 2004. The future of Japanese quail for research and production. World's Poultry Science Journal, 60, 500–507.
15. Mizutani, M. 2003, The Japanese Quail. Labortatory Animal Research Station, Nippon Institute for Biological Science, Kobuchizawa, Yamanashi, Japan, 401-441
16. Othman P. Abdulkarim, A. F. Abdulrahman. 2017. Evaluate the Productive Performance of Two Varirties of Japanese Quail Brown and Black. Sixth Scientific Conference of Agricultural Sciences, Tikrit University of Agricultural Sciences: 437-442.
17. Ozbey, O., Ozceli, M. 2004, The effect of high environmental temperature on growth performance of Japanese quails with different body weights. International J. Poult. Sci., 3(7):468-470.
18. Rudik O., Tetiana Kot, Svitlana Guralska, Yuriy Dovhiy, and Olena Zhytova. 2021. Micropathology of the Internal Organs of Japanese Quails Naturally Infected with Eimeria tenella. J. World Poult. Res. 11(3): 322-331.
19. Sakomura, N. K. and Rostagno, H. S. 2016. Métodos de pesquisa em nutrição de monogástricos. 2 ed. Funep, Jaboticabal
20. SAS. (2004). SAS / STAT Users Guide for personal computer; Release 6-12. SAS Institute Inc. Cary, NC. USA.
21. Tavaniello, S. 2013. Effect of cross-breed of meat and egg line on productive performance and meat quality in Japanese quail (Coturnix japonica) from different generations. Ph. D. Thesis, Univ. of Molise.
22. Thear, K. 2001, Keeping quail: A guide to domestic and commercial management.
23. Waleed R. Naseer. 2020. Effect of the Ration Form on Productive Performance of Three Japanese Quail Breeds. Journal of Agricultural, Environmental and Veterinary Sciences. 4 (1): 30 Mar 2020: 12 - 29
24. Zayed, A. Abdul Rahman, M. K. Ahmed and N. S. Yahya. 2000. Poultry genetics and breeding. Translator book, Omar Al-Mukhtar University, Benghazi, Libya.
25. Zofia . T., M.Ligoki , D.Szefrbinska , D.Majowska and A.Danczak . 2006. Different level of crud protein and energy –protein eation in adult quail diet.Arch. tierz. Dummersterf 49. Special Issue, 325 – 331.