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COMPARISON OF THE PRODUCTIVE PERFORMANCE OF THE CARCASS TRAITS IN THE SELECTED GROUPS FOR THE AGE TRAIT AT SEXUAL MATURITY IN JAPANESE QUAIL FEMALES (*COTURNIX COTURNIX JAPONICA*)

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Abstract

This study was conducted in the Field of Department of animal production belonging to College of Agriculture, University of Tikrit for the period from 20/10/2012 until 20/6/2013. The study aimed to comparison of the productive performance of the carcass traits for the selected Japanese quail bird (*Coturnix coturnix japonica*) of the age trait at sexual maturity and for two generations. The basic herd was obtained from the herd of the General Authority for Agricultural Research in Abu Ghraib belonging to Ministry of Agriculture. The eggs were collected from the herd and It was hatched in a hatchery belonging to the aforementioned college. In addition, after the hatching, the birds were divided after the completion of the sexual maturity of the female to three groups, Male herd prepared with early age of (39.16 days), mediumage of (42.57 days) and birds with late age of (48.12 days) for age trait at sexual maturity. A 90 female were selected and distributed on cages and each treatment included 10 families with one male and three females per family (30 males and 90 females. The eggs were collected from the parents herd and It was numbered after hatched according to their parents and their early groups (37.26 days), mediumage of (41.67 days) and birds with late age of (47.10 days) for age trait at sexual maturity, The eggs were fertilized at 21 days in the same way as parents. The birds were transported to a hall dedicated to breeding the Japanese quail bird, containing cages of three floors divided into 40 × 40 × 40 cm rooms. The birds were distributed according to groups and families with one male and three females per family (30 males and 90 females). Age was recorded when the first egg was produced for early, medium and late groups and the same traits that conducted on the parents' generation was measured. The results showed a significant superiority of the late and mediumage groups at sexual maturity in the average of body weight trait, carcass, femurs , liver, and Gizzard compared with the early group. The late age group also has excelled the age of sexual maturity in the average weight of chest and the percentage of dressing compared to the early group. The mediumage group at the sexual maturity was excelled in the average weight of wings compared to the early group, while no significant difference was observed between the three groups of early, medium and late age at the sexual maturity.

Key words: Japanese quail bird, age at the sexual maturity, carcass traits.

Introduction

Poultry meat is a strong competitor to red meat for its high nutritional value. It is economical and easy to prepare meat. It is characterized by low content of unsaturated fatty acids and its protein is an important source of essential amino acids necessary for human nutrition (Fayadh *et al.*, 2011). Many countries have expanded the production of Japanese quail bird, China has topped the list of countries with an estimated bird population of 270-300 million birds per year (2009, Rogerio). Egypt and Saudi Arabia are considered among the Arab countries that are interested in breeding and producing Japanese birds, despite the small size and weight of the birds where birds reach a weight of more than 200 g at six weeks age (Abdel-azeem *et al.*, 2001). A Japanese quail bird is also considered of migratory birds, which human has previously favored and began to breed and develop it to the production of meat and eggs and the largest percentage of these birds breeded in South and East Asia (Minvielle *et al.*, 2002). It is characterized by fullness of the chest area with meat as well as consumption of a small amount of feed and is resistant to many diseases and characterized by rapid growth and high efficiency of metabolism. His meat is also considered a fine and distinctive food consumed on special occasions

in China, America and France (Nagy et Acharon, 2007). The Japanese quail birds are also characterized by its small size, compacted body, chunky, short-tailed, Fast-moving and able to fly at a low level (Gaviol *et al.*, 2008). The growth rate is affected by the selection but it does not lose sight the importance of the relationship between genetics and the environment. The growth rate is strongly influenced by nutrition, the favorable environmental conditions, the health level of the herd, and other management and care factors that help the bird show its genetic potential in rapid growth. The main objective of this study is to determine the selection for the age trait at sexual maturity and its effect on the traits of the carcass herds of Japanese quail bird for two generations.

Materials and methods

This study was conducted in poultry field, Department of animal production belonging to College of Agriculture, University of Tikrit for the period from 20/10/2012 until 20/6/2013. A 120 birds were breeded with one-day age of Japanese quail bird which obtained from the herd of the General Authority for Agricultural Research in Abu Ghraib belonging to Ministry of Agriculture in which random mating was conducted it. Females were sexed at the age of 21 days and distributed individually on cages. Age was recorded when the first egg was produced for each female, was divided into three sexual maturity groups are: early, medium and late (39.16, 42.57, 48.12 days), respectively for the parents' generation. Each group was divided into 10 families with one male and three females per family in individual cages of (40 × 40 × 40 cm) in a closed hall. In the same way, the generation of the resulting offspring was distributed from the same eggs assigned to the above parents and at the age of sexual maturity (37.26, 41.67 and 47.10 days) for the early, medium and late age groups when the sexual maturity was, respectively. The birds were fed on the growth ration with 22.84% protein, Dietary energy (2998 kCal / kg feed) and productivity ration (19.56%) and Dietary energy (2753 kCal / kg feed) as shown in table 1 and information provided by (N.R.C, 1994). Six females were slaughtered at the age of 6 weeks of each group for both the first and second generations and randomly calculated the following traits:

1- **Live body weight (g) :** The females were weighed for both the parents and children generation in the sensitive balance type Citizen Model Fr-H1200 and accuracy of 0.01 g (two digit after point).

2- **The weight of the carcass (g):** The carcass was weighed for both the parents and children generation in a sensitive balance of Citizen type Fr-H1200 and 0.01g (two digit after point).

3- **The percentage of dressing (%):** It is calculated according to the following equation:

$$The\ percentage\ of\ dressing(\%) = \frac{The\ weight\ of\ the\ cleaned\ carcass}{The\ weight\ of\ the\ body} \times 100$$

4- The relative weight of the cuts in the carcass (chest, femurs, back and wings) were measured for the parents and children generation was measured in a sensitive balance, Citizen type Fr - H1200, and 0.01 g (two digit after point) after dividing the weight of the cut on the body weight.

The experiment was designed on the basis of a Completely Randomized Design (CRD), SAS (2010) was used in the analysis of the studied traits according to the following mathematical model. The averages treatments were compared using Duncan multidimensional test (Duncan, 1955), with a probability level of 0.05 to determine the significant differences between the averages.

$$Y_{ij} = \mu + T_i + e_{ij}$$

where:

Y_{ij} = View value j belonging to group i

Table 1: Percentages and chemical composition of used Japanese quail bird in the experiment (initiator and production)

Feed materials	Initiator ration (%)	Production ration(%)
Yellow corn	53.6	54.2
Wheat	37	34
Soybeans meal	5	-
Proteins Center	-	2.5
Premix	3	2
Plant oil	1.1	7
limestone	0.3	0.3
Food salt	100	100
Total	53.6	54.2
The calculated chemical analysis*		
Crude protein (%)	22.84	19.56
Dietary energy (kCal / kg)	2998	2753
Phosphorus (%)	0.79	3.21
Calcium (%)	0.37	0.37
Lysine (%)	1.33	1.09
Methionine (%)	0.51	0.45
Methionine + Cysteine (%)	0.86	0.78
Raw fibers (%)	3.86	3.57

* The values of the chemical composition of feeds found in the ration composition were calculated according to the reports of the National Research Council of America (NRC, 1994)

μ = The general average of the studied trait.

T_i = group effect i

e_{ij} = The random error that distributed by natural and independent distribution with an average of zero and an variation equal to $\sigma^2 e$.

Results and discussion

The scale of carcasses depends on several factors, including the measures of carcasses, such as the rotation degree of both the chest and femurs, where the scale is higher when the increase the rotation of chest, the chest fullness and the breadth of the femurs of the carcass, this will affect the containment of these carcasses on a high proportion of excellent cuts such as the thigh and chest, which leads to increased hoarding Muscles with good rotation and improved appearance. The important measurements that are included in the assessment of carcasses is the body weight, which is an indication of the amount of meat that naturally affects the production, which is the final outcome of the growth rate, which is reflected on the weight of the carcass and considers both genus, strain, age and nutrition factors that affect the body weight and growth rate (Al-alwani, 2002). Table 2 shows the effect of the selection for the age trait at sexual maturity in the average weight of live body, it showed there was a significant differences at level of ($p<0.05$) between the selected lines (early, medium and late) for the age trait at sexual maturity. It is noted that the general average and the two generations of parents and children were in the medium and late line of the age trait at sexual maturity superior to the early line of the age trait at sexual maturity. This may be due to the high body weights of these lines to the growth rate and the ability to precipitate protein, in addition to a positive correlation coefficient between the two traits of body weight at one day age and the average of final body weight. This study agrees with (Al-Maeini *et al.*, 2007) during their studies on two genus of Japanese quail bird with brown and black feathers. it also agreed with the results of (Al-Shammari *et al.*, 2012) in their study on Japanese quail bird. The results of the body weight trait have agreed with (al-Tikriti and Al-jomely, 2013) in their studies on two genus of Japanese quail bird with brown and black feathers. These results differed with (Kosshak *et al.*, 2014), where they found in their study on Japanese quail bird that the average weight of body at slaughter was 133.63 g.

The weight of the carcass

Table 2 shows that there was significant differences in the weight of carcass trait among the three groups (early, medium and late) for the age trait at sexual maturity and for both parents and children where their values amounted to (158.80, 165.83; 177.58, 187.11; 180.93, 192.28 g), respectively. The difference in the weight of the carcass may be due to the fact that some genus have high genetic susceptibility to rapid growth or fat deposition (Ozbey, Zcelik, 2004; Abdul Sattar, 2016). These results did not agree with (Al-Shammari *et al.*, 2012) in their study on some traits of the carcass and its measurements for the cuts of Japanese quail bird.

The percentage of dressing

It is considered as one of the important economic traits being the edible portion of the carcass, It is defined as the percentage of the weight of the carcass cleaned to live weight (the bird before slaughter). The percentage of dressing varies according to the genotypes, genus and age of the bird. The increase in its percentage in the selected group for the age trait at sexual maturity is due to the increase in the body weights of this group and the presence of a positive correlation coefficient between body weight and the percentage of dressing (Abdel Razak and Hassan, 2016). The reason for this difference is also due to several factors, including genus, age, and live weight of the bird, as well as the conditions of breeding and nutrition (Naji *et al.*, 2007; Abd al-Sattar, 2016). The increase in the Japanese bird's carcass is reflected in the main cuts such as the chest and the thigh as they are the important parts of the carcass parts and as a result of the high significant ($P>0.05$) in the main cuts of the carcass, usually accompanied by a decrease in the relative weights of the secondary cuts (back, wing and neck). The results showed that there were significant differences in the percentage of dressing trait in the selected cuts for the age of late sexual maturity compared to the early age group for the age of sexual maturity of both The two generations and their general average. There were no significant differences between the late and medium group and between the medium and early groups to the same trait. The reason for this difference to the significant differences in the living body weight of the fact that this trait reflects the weight of the body so the higher the body weight the higher the percentage of dressing. These results agreed with (Al-Tikriti and Al-jomely, 2013) in their studies on the percentage of dressing, its value in the black strain (feather color) at age of 35 days amounted to 69.51% while in the brown strain (feather color) amounted to (67.84%). These results agree with (Saber, 2018) study of the production performance of the Japanese quail bird, The values of the percentage of dressing were 63.92 - 65.37%. Table 2 shows there was a significant difference in the relative weight of the cuts in birds attributed to the in vivo weight of each line. The results showed that the general average and the two

generations of parents and children for the femurs cuts was in the medium and late line for the age trait at sexual maturity, excelling on the early line for the age trait at sexual maturity. These results agree with (Alkan *et al.*, 2010; Ojedapo and Amao, 2014) who found significant differences in the cuts of femurs in their study on some carcass traits of Japanese quail bird. These results differed from those of (Khimshi, 2005; Kosshak *et al.*, 2014) in their study on the evaluation of some cuts of the Japanese bird's carcass. It is also differed with (Ocak and Erener, 2005) about There were no significant differences in the weight of the femurs in their studies on Japanese quail bird. Table 2 shows the effect of the selection significantly on the early, middle, and late cuts for the age trait at sexual maturity and in both two generations of parents and children and general average of them. The late birds have excelled compared to the other two groups and at the level of <0.05 <P) in the weight of chest by giving it (52.31, 58.16, 55.23 g) for both parents and children and the general average, respectively. These results agree with (Kaye *et al.*, 2017) in their study of some of the carcass traits of Japanese quail bird. They indicated that the height of the chest cut compared to the other cuts of the carcasses of Japanese quail bird, The chest cut accounted of the highest percentage of the dressing percentage. The study agreed with (Al-Obeidi and Al-Fayadh, 2001) that the weight of the chest cut to be higher than other cuts of Japanese quail bird carcasses. The results of the study did not agree with (Daikwo *et al.*, 2013) in their study on some of the carcass traits for a cuts of Japanese quail bird. The average weight of chest was 29.73 g. These results were not consistent with the data obtained by (Kosshak *et al.*, 2014) in their study of some carcass traits of Japanese quail bird. The chest weight in their study was 41.88 g. These results differed with (Hamada *et al.*, 2016) in their study parts of the carcass of two groups of natural and Mutation Japanese quail bird at the age of 56 days. The results were not consistent with (Al-Badiri, 2017) in his study of Japanese quail bird, found that the weight of the chest at the age of 4 and 6 weeks was (35.40 and 38.16 g), respectively.

The weight of the wing

Table 3 shows significant differences in the weight of wings. The medium group for the age trait at sexual maturity was excelled on the early group for the age trait at sexual maturity in the general average and Generation, while no significant differences were observed between the medium and late groups and also between late and early groups for the same trait. These results were consistent with (Almuouo and Ojo, 2015) in their study of some cuts of Japanese quail bird carcasses. The average weight of the wing in the male carcass was 4.24 g and the female 3.60 g. These results also agreed with (Caglayan and Seker, 2013) in their study of Japanese quail bird where they found values less than the values obtained. The results of Alkan *et al.*, (2010) did not show a significant difference in the trait of the weight of the wing between heavy, light and medium weight groups in its study on the Japanese quail bird.The weight of the wing in the three groups mentioned above may be due to different body weight. A positive correlation coefficient was found between body weight and wing weight. The results in Table 3 did not show a significant difference in the two traits of the head and neck weight scales of selected groups (early, medium and late) for the age trait at sexual maturity and for both two generations of parents and children and general average. The study agreed with (Alkan, 2010) in their study on three groups of Japanese birds are

Table 2: Age at sexual maturity (day) and its effect on live body weight (g), carcass weight (g), femurs weight (g), chest weight (g) and the percentage of dressing (%) (averages ± standard error)

Traits	Generation	Treatments		
		Early	Medium	Late
Live body weight	**Parents**	182.47 ± 4.67b	209.48 ± 5.22 ab	207.84 ± 6.36 a
	Children	191.63 ± 4.27c	219.67 ± 4.33 b	228.26 ± 2.01 a
	Average	187.05 ± 3.45 B	214.58 ± 3.79 A	209.55 ± 4.75 A
Carcass weight	**Parents**	158.80 ± 3.12 b	177.58 ± 3.66 a	180.93 ± 1.39 a
	Children	165.83 ± 2.71 b	187.11 ± 2.50 a	192.28 ± 0.63 a
	Average	162.31 ± 4.04B	182.34 ± 2.91A	184.60 ± 3.50 A
Femurs weight	**Parents**	26.60 ± 0.37 b	28.77 ± 0.90 a	27.33 ± 2.02 a
	Children	27.26 ± 1.43 b	31.27 ± 0.78 a	31.61 ± 0.42 a
	Average	26.93 ± 0.72B	30.02 ± 0.94 A	29.47 ± 1.24 A
Chest weight	**Parents**	46.28 ± 2.52 b	49.58 ± 2.69 a	52.31 ± 0.96 a
	Children	48.89 ± 3.17 a	57.51 ± 1.64 a	58.16 ± 3.04 a
	Average	47.58 ± 1.83 B	53.55 ± 2.29 AB	55.23 ± 1.70 A
The percentage of dressing	**Parents**	67.21± 3.53 b	69.01± 1.80 ab	70.12± 1.83a
	Children	68.32± 4.65 b	69.89± 2.51 ab	71.03± 1.58a
	Average	67.77± 3.85 B	69.45± 2.31 AB	70.57± 2.09A

* The different large letters within the same row indicate significant differences (p= 0.05)
* The different small letters within the same column indicate significant differences (p= 0.05)

Table 3: Average of age at sexual maturity (day) and its effect on head weight, wing weight, neck weight and back weight Liver weight (averages ± Standard error)

Traits	Generation	Treatments		
		Early	Medium	Late
head weight	**Parents**	8.39 ± 0.31	7.89 ± 0.34	8.10 ± 0.18
	Children	8.46 ± 0.45	8.50 ± 0.31	8.17 ± 0.41
	Average	8.42 ± 0.24	8.20 ± 0.24	8.54 ± 0.20
wing weight	**Parents**	8.17± 0.54 b	9.27 ± 0.66 a	9.39 ± 0.16 a
	Children	8.79 ± 0.51 a	11.14 ± 0.46 a	10.19 ± 0.72 a
	Average	8.48 ± 0.36B	10.20 ± 0.59A	9.79 ± 0.42 AB
neck weight	**Parents**	4.78 ± 0.35	5.65 ± 0.38	5.79 ± 0.53
	Children	7.05 ± 0.41	5.31 ± 0.23	4.89 ± 0.10
	Average	5.91 ± 0.56	5.48 ± 0.21	5.34 ± 0.31
back weight	**Parents**	20.64 ± 0.96 b	24.41 ± 0.85 a	22.12 ± 0.97 ab
	Children	27.22 ± 3.34 b	34.42 ± 1.99 ab	39.83 ± 4.50 a
	Average	23.93 ± 2.14 B	29.41 ± 2.44 A	30.97 ± 4.46 A
Liver weight	**Parents**	3.78 ± 0.17 b	5.35 ± 0.28 a	5.79 ± 0.36 a
	Children	6.21 ± 0.31 b	6.48 ± 0.34 a	6.74 ± 0.41 a
	Average	4.99 ± 0.24 B	5.91 ± 0.31 A	6.26 ± 0.38 A
Gizzard weight	**Parents**	3.64 ± 0.23 b	4.66 ± 0.32 a	4.91 ± 0.35 a
	Children	4.43 ± 0.29 b	5.01 ± 0.46 a	5.49 ± 0.38 a
	Average	4.03 ± 0.26 B	4.83 ± 0.39 A	5.20 ± 0.36 A

* The different large letters within the same row indicate significant differences (p= 0.05)
* The different small letters within the same column indicate significant differences (p= 0.05)

(light, medium and heavy weight of the body), did not find significant differences in the two traits of the head and neck weight. It is differed with the results of (Kaye *et al.*, 2017) where they found significant differences in the weight of the head in his study on three generations of Japanese quail bird.The results did not show any significant differences in the results of (Al-Budeiri *et al.*, 2017) in their study on Japanese quail bird for the trait of the weight of the neck. Table 3 shows significant differences in the weight of the back, liver and Gizzard between the three groups of early, middle and late for the age trait at sexual maturity for both two generations of parents and children and general average. These results were consistent with the data obtained by Abdul Sattar (2016) that there was a significant difference in the cuts of the secondary carcass (liver and Gizzard) in his study on Japanese quail bird. It also agreed with Saber (2018) in his study on Japanese quail bird that found a difference in the weight of the liver between the treatments of the study, while found no difference in the weight of the Gizzard.

We conclude from this that the selection for age trait at sexual maturity has had a clear effect on most of the traits of Japanese quail bird carcasses, which necessitates a deeper study on this subject in order to obtain a database to determine the genetic parameters for the selection of carcasses trait.

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