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Research Article

The Effect of the Selection for the Age Trait at Sexual Maturity of Two Generations in the Productive Performance of Black Japanese Quail Bird

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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 1/10/2013 until 1/6/2014 to determine the effect of the selection for the age trait at sexual maturity of black Japanese quail bird on some productive traits, in the study, A 60 birds were used from the assigned herd of the previously mentioned Department. The birds were individually distributed in cages and recorded the date of the first egg for each female. The selected females were divided into three groups: early, medium and late age at sexual maturity. Each group included five families with one male and three females per family. The total number used in the study was 15 males and 45 females. The eggs were hatched to produce the sons's generation according to their groups and their families, the productive characteristics were recorded for both parents and sons. The results showed significant superiority of late sexual maturity group in the average body weight at sexual maturity compared to early sexual maturity group. The early sexual maturity group has excelled in the trait of the average egg production and feed consumption compared to the medium and late sexual maturity group. The early sexual maturity group has excelled in the trait of the average egg production and feed consumption compared to late and medium sexual maturity group. The early and medium sexual maturity group excelled in egg mass and dietary conversion efficiency compared with late sexual maturity group, while no significant difference was observed in the average weight of the first egg and the weight of eggs between the selected groups of early, medium and late age at sexual maturity.

Keywords | Japanese quail bird, Age at the sexual maturity, Weight at sexual maturity, Food consumption

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INTRODUCTION

Japanese quail bird is considered a guide to study the improvement of domestic poultry because it is the smallest species of poultry to produce meat and eggs (Hussain et al., 2016). its economic importance come from the scientific experiments due to its early sexual maturity, Females start laying the first egg at the age of 35-42 days, the age at which females reach sexual maturity, with average weight of 140-150 g (Al-Tikriti and Al-Doori, 2018). Japanese quail bird is considered of the important birds in the production of eggs, Where females (with improved strains) place about 300 eggs per year all these things made the Short generation duration and Its little consumption of feed compared to the rest of poultry bird, there is a close relationship between Hatching chicks and its rapid sexual maturity and thus will begin to produce eggs early and that such chicks are suitable for the purposes of electoral objectives in the strain (Al-Tikriti, 2010). The selection leads to an increase in the desired gene ratio by increasing the offspring of superior parents, in order to improve any strain, First, it must study its genetic features and its traits so that it can formulate a specific policy on scientific grounds to advance towards the desired goal (Jalal and Karam, 2003). Thus, the selection is an important means of improvement but it takes a long time to reach the desired goal. Therefore, researchers have found many ways to achieve a tangible return in the shortest possible time to reduce the costs of

breeding and management and such methods are early age selection (Saber, 2018).

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 1/10/2013 until 1/6/2014. The study aimed to determine the age at the sexual maturity of Japanese quail bird and the responsiveness of its production traits, which helps the breeder to early selection of birds depending on the age traits at sexual maturity. In this study, A 60 birds of Japanese quail bird with one-day age were used which were obtained from the herd belonging to Department of Animal Production, College of Agriculture, University of Tikrit. The birds were fed on a ration with a crude protein level of (22.84%), Dietary energy of (2998 kCal / kg feed) from one day to the age of 30 days, after that fed on ration with the level of crude protein (19.56%) and Dietary energy of (2753 kCal / kg feed) until the end of the experiment. It was transferred to a hall dedicated to the breeding of Japanese quail bird, where containing three-storey cages (homemade) and divided to rooms with dimensions 40 x 40 x 40 cm, Females were randomly distributed in each room, the production age of the first egg and body weight was recorded together for each female, after the completion of the females maturity at the age of 49 days, it was distributed to three groups are early sexual maturity, medium sexual maturity, late sexual maturity. A 45 females were selected and distributed to cages. Each treatment consisted of five families with one male and three females per family (15 males and 45 females). The eggs were collected from each family, the eggs were hatched in the hatchery. The sons were numbered after being hatched according to their parents and their early, medium and late age groups at sexual maturity, and the same traits were measured that conducted for parents.

Studied Traits

Sexual maturity (day): The placing of the first egg by the female was considered as guide on her arrival to the age of sexual maturity of both the parents' and sons's generation, according to (North and Bell, 1990).

Body weight at sexual maturity (g): Females were weighed individually when laying the first egg (age at sexual maturity) for both parents and sons in a sensitive balance type Citizen Model Fr - H1200 and 0.01 g accuracy (two digit after point).

Weight of the first egg (g): The weight of the first egg placed by each female for the generation of parents and sons using a sensitive balance type citizen model Fr - H1200 and 0.01 g (two digit after point).

Egg weight (g): The weight of eggs per day for each generation of parents and sons was calculated by the weight of eggs produced during the duration of the experiment divided by the number of eggs produced and according to the equation.

$$\textbf{Average weight of eggs} = \frac{\text{Total egg weight product during the first 45 days of production}}{\text{The number of eggs produced during the first 45 days of production}}$$

Egg Production (%): The eggs were collected once at 9 am every day for the duration of the experiment (45 days of laying the first egg) for each generation of parents and sons, The daily production of each family was recorded for that day (Hen day egg production) and the egg production rate was calculated on the basis of H.D% according to the equation (Al-Fayadh and Naji, 1989).

Egg Mass (Gram / Bird): The produced egg mass for each generation of parents and sons was calculated using the following equation:
Produced Egg mass = number of produced eggs during a given period of time × egg weight (gm)
(Al-Fayadh and Naji, 1989).

Feed consumption and dietary conversion efficiency: The amount of feed consumed for each generation of parents and sons was calculated by the weight of feed remaining at the end of each week and subtract it from the feed provided at the beginning of the week to extract the average consumption of feed per day (g / bird / day) and calculated the efficiency of dietary conversion required to produce one gram of Eggs according to the following equation (Al-Zubaidi, 1986):

$$\textbf{Dietary conversion efficiency (g feed / g egg)} = \frac{\text{Average daily feed consumption (g / bird)}}{\text{Average produced egg mass (g / day)}}$$

Statistical Analysis

The data were analyzed using complete randomized design (CRD) to study the effect of treatments in the studied traits. A significant differences between the averages were compared using the Duncan Multidisciplinary Test (Duncan, 1955). Statistical program SAS (2001) was used in statistical analysis.

RESULTS AND DISCUSSION

Age at Sexual Maturity (Day)

Table (1) shows significant differences ($p \leq 0.05$) in the traits of the average age at sexual maturity between the three groups (early, medium, late) and selected for the age

Table 1: Effect of the selection on the average age at sexual maturity (day) on body weight at sexual maturity (g), weight of the first egg (g) and weight of eggs (g) {averages ± standard error}

Traits	Generation	Treatments		
		Early	Medium	Late
The average age at sexual maturity (day)	Parents	40.00 ± 0.44c	44.00 ± 0.44b	48.00 ± 0.44a
	Sons	38.80 ± 0.37c	42.80 ± 0.37b	46.80 ± 0.37a
	Average	39.40 ± 0.33C	43.40 ± 0.33B	47.40 ± 0.33A
The average weight of body at sexual maturity (g)	Parents	188.50 ± 2.71 c	200.90 ± 1.96 b	208.50 ± 1.52 a
	Sons	193.55 ± 2.93 c	204.57 ± 2.47 b	213.62 ± 1.61 a
	Average	191.02 ± 2.06 C	202.74 ± 1.60 B	211.06 ± 1.34 A
The average weight of first egg (g)	Parents	8.06 ± 0.30 a	8.02 ± 0.31 a	8.02 ± 0.36 a
	Sons	8.44 ± 0.20 a	8.69 ± 0.20 a	8.04 ± 0.25 a
	Average	8.25 ± 0.18 A	8.36 ± 0.20 A	8.03 ± 0.21 A
The average weight of egg (g)	Parents	11.24 ± 0.20a	11.28 ± 0.19a	11.42 ± 0.18a
	Sons	11.38 ± 0.12a	11.65 ± 0.13a	11.51 ± 0.13a
	Average	11.31 ± 0.10A	11.47 ± 0.12A	11.46 ± 0.11A

* The different large letters within the same row indicate significant differences ($p \leq 0.05$) between averages

* The different small letters within the same column indicate significant differences ($p \leq 0.05$) between groups

at sexual maturity. The average values of the two generations for each group were (39.40, 43.40, 47.40 days), respectively. The average age at sexual maturity in the early age groups of parents and sons amounted (40.00, 38.80 days), respectively. Their values in medium groups have amounted of (44.00, 42.80 days), respectively, while the average age at sexual maturity was (48.00,46.80 days) respectively. The results indicated that the selection reduced the age of sexual maturity of the Japanese quail bird in the three groups. Al-Shaheen (2006), Taha (2009), Abo-Samaha et al. (2010), Tikriti (2010) and Qaisi et al. (2016) reported that the average age at sexual maturity has decreased after generation after generation compared to the base generation in their study on the Japanese quail bird. We conclude from the low age of sexual maturity in the generation of sons compared to the generation of parents that there is a sign and indication of increased egg production because of the negative relationship between the production of eggs and age at sexual maturity.

Body Weight at Sexual Maturity

Table (1) shows significant differences ($p \leq 0.05$) in the average of two generations for trait of the body weight at sexual maturity between the three groups selected for age trait at early, medium and late sexual maturity, the average weight of body at sexual maturity amounted of (191.02, 202.74, 211.06), respectively. The results show that the late group is excelled on the medium and early group, the medium group is also excelled on the early group. This is due to the fact that the late group of the age of sexual maturity gave it the greatest time for feed conversion to growth rather than egg production as in the early age group at sexual maturity and thus increased body weight in the late age group at sexual maturity. The reduce of body weights in the early groups are also indicative of the increase in the number of eggs. Also, there is a negative correlation between body weight at sexual maturity and egg production (Tikriti, 2010).These results agree with (Kosba et al., 2002; Camci et al., 2002; Reddish et al., 2003; Bahi El-Deen et al., 2008; Al-Qaisi., 2014) in their study on Japanese quail bird, found the late groups for trait of average body weight at sexual maturity were excelled on the medium and early groups. The results also showed an improvement in the average body weight at the sexual maturity of the child generation compared to the parents' generation for both early, medium and late groups, their average values for the parents' generation were amounted of (188.50, 200.90, 208.50 g), respectively. While it increased in the sons generation, their weights reached (193.55, 204.57, 213.62 g), respectively. The reason for the increase in body weight at the sexual maturity in the herd of sons for the three groups to the act of selection, as it worked on the homogeneity of the herd as well as work to get rid of unwanted genes, especially disease, as we know that the nutritional and administrative conditions are fixed in the two generations (Al-rawi, 2006) it is noted that the base generation was excelled on the first generation for trait of the average body weight at sexual maturity and its values were (147.59, 140.50 g), respectively. It also agreed with (Al-Takriti et al., 2011) that the average body weight at sexual maturity was (187.54 g) in the first generation, or (192.69 g) in the second generation of Japanese quail bird. The results did not agree with (Al-Shaheen, 2006) in her study of Japanese quail bird, It also did not agree with (Shalan et al., 2012) in his study of the Japanese quail bird. The first generation of the average body weight at sexual maturity was (195.70, 192.23 g), respectively.

The Weight of First Egg

Table (1) shows no significant differences in the average weight of the first egg for both the early and medium and the late groups age at sexual maturity. Their average values for two generations were (8.25, 8.36, 8.03 g), respectively. This results agree with (Al-Rahawi, 2010), The weight of the first egg in the control treatment was (8.85 g) during the study of Japanese quail bird. The results agree with (Al-Qaisi., 2014) in their study on Japanese quail bird, they did not notice any significant differences between the three groups of (early, medium and late), which their average values were (7.88, 8.42, 8.94 g), respectively. It also turned out that there was an arithmetic improvement in the sons generation compared to the parents' generation, The average weight of the first egg was in the early groups of both parents and sons generations (8.06, 8.44 g) respectively, in medium groups (8.02, 8.69), respectively, and in the later groups (8.02, 8.04) respectively. This may be due to the fact that the higher body weight affects the weight of the egg higher than the effect on the number of eggs produced so We conclude from the high average weight of the first egg in the three groups and in the generation of sons to increase body weights at sexual maturity and also due to the existence of a correlation coefficient of positive Genetic and phenotypic between the two traits of body weight at sexual maturity and the weight of the first egg (Al-rawi, 2001).

Egg Weight

Table (1) shows no significant differences in the average weight of egg for both early, medium and late age groups at sexual maturity, which had an average value for two generations of (11.31, 11.47, 11.46 g).The early age birds at sexual maturity characterized by high efficiency metabolism at the cellular level, It is also characterized by the effectiveness of high physiological access to a high dietary conversion coefficient as a result of the evolution of the digestive system to help provide the body highly effective nutrients necessary for growth and development, this integrated system made individuals early age give the weight of eggs is close to those of late maturation despite being more productive for eggs and less in body weight. These results were consistent with (Camci et al., 2002; Bahi El-Deen et al., 2008; Al-Qaisi et al., 2016) in their study on Japanese quail birds. They did not find any significant differences in average weight of egg between early and medium groups for age trait at sexual maturity. The results did not agree with (El-Dlebshany, 2008) in the study of the laying hens (Alexandrian strain), selected for the age trait at sexual maturity. There was a significant superiority of the late groups on the medium and early groups in the average weight of eggs and reached (37.9, 35.3, 33.0 g), respectively during 90 Days of production. The results did not agree with (Bahi El-Deen et al., 2009) noting the superiority of early, medium and selected groups of age trait at sexual maturity in the average weight of eggs on the late group in their study on Japanese quail bird. The same table shows no significant differences in the average weight of eggs between the sons generation and the parents' generation. The average weight of eggs in the parents' generation for the early, middle and late groups of (11.24, 11.28, 11.42 g), respectively, Either in the generation of sons, an average weight of eggs reached (11.65, 11.51 g) respectively. These results were consistent with (Al-Tikriti, 2010). The average weight of eggs in the fourth generation was higher than that of the first generation in their study of the brown Japanese quail bird which reached (11.54, 10.66 g), respectively. This results also agree with (Latif, 2011) in his study on Japanese quail bird, noting that there were no significant differences in the average weight of eggs between the second generation and the first generation (11.42, 11.36 g), respectively. The results were not consistent with (Okenyi et al., 2013), noting that there were significant differences in the average weight of eggs. The first generation was more than the first generation and the second was (11.41, 10.84, 9.33 g), respectively.

Egg Production

The results of the statistical analysis from Table (2) also showed significant differences ($p \leq 0.05$) in the percentage of egg production (HD%) within 45 days for the early, medium and late groups. The early group has excelled on both medium and late groups for age trait at sexual maturity, while medium group has excelled on the late group. This is due to an association between the average egg production and the age at sexual maturity. The higher the age of sexual maturity, the higher the egg production (Al-Tikriti, 2010). Also the reason is that there is an inverse relationship between body weight and egg production. Birds with low body weight produces more numbers of egg compared with high body weight birds. The results agree with (Camci et al., 2002) observed that the early totality of the average egg production was higher than the medium, late, and selected age groups at sexual maturity in his study on Japanese quail bird. The results also agreed with (Bahi El-Deen et al., 2008) observed that the early group was superior to the middle and late age group at sexual maturity. The average egg production for the Japanese quail bird was within 45 days of the onset of sexual maturity (93.32, 83.40 and 72.16%), respectively. These results also agree with the results of (Shalan et al., 2012, Sadeghi et al., 2013) showed in their study on Japanese quail bird that the selection of age trait at early sexual maturity led to an increase in the average of egg production during the study period. The results also agree with (Al-Qaisi et al., 2016), which found that the early group has excelled on the medium and late age group at sexual maturity. The average of egg production of Japanese quail bird during 70 days of the onset of sexual

Table 2: Effect of the selection on the average age at sexual maturity (day) on egg production (g), egg mass (g / bird / day), feed consumption (g / day / bird) and dietary conversion efficiency (g feed / g egg) {averages ± standard error}

Traits	Generation	Treatments		
		Early	Medium	Late
The average of egg production (g)	Parents	89.33 ± 0.29a	85.92 ± 0.52b	76.73 ± 0.79c
	Sons	91.40 ± 0.37a	86.51 ± 0.79b	81.62 ± 1.08c
	Average	90.36 ± 0.41A	86.21 ± 0.45B	79.18 ± 1.03C
egg mass (g / bird / day)	Parents	10.04 ± 0.19a	9.70 ± 0.22a	8.76 ± 0.21b
	Sons	10.13 ± 0.10a	10.08 ± 0.17a	9.41 ± 0.23b
	Average	10.09 ± 0.10A	9.89 ± 0.14A	9.08 ± 0.18B
The average of feed consumption (g / day / bird)	Parents	28.83 ± 0.24a	27.95 ± 0.13ab	27.83 ± 0.45b
	Sons	28.09 ± 0.08a	27.67 ± 0.24a	27.74 ± 0.22a
	Average	28.46 ± 0.17A	27.81 ± 0.14B	27.78 ± 0.23B
The average of dietary conversion efficiency (g feed / g egg)	Parents	2.87 ± 0.06b	2.89 ± 0.06b	3.18 ± 0.12a
	Sons	2.77 ± 0.02b	2.74 ± 0.06ab	2.95 ± 0.07a
	Average	2.82 ± 0.03b	2.81 ± 0.05b	3.07 ± 0.07A

* The different large letters within the same row indicate significant differences (p≤ 0.05) between averages
* The different small letters within the same column indicate significant differences (p≤ 0.05) between groups

maturity amounted (92.57, 85.47, 79.85%), respectively. The results showed that there was no significant difference, but there was a significant improvement in the sons generation compared to the parents' generation in the egg production trait which amounted to (89.33, 91.40 and 85.92, 86.51 and 76.73, 81.62 %), respectively for three groups(early, medium and late). The results agree with (Al-Douri, 2010), There were no significant differences in egg production between the maternal and child generations, which reached (79.80 and 79.07%), respectively, within 70 days of laying the first egg in their study on Japanese quail bird. The results differed with those obtained by Latif (2011), There were no significant differences in the average of egg production between the first generation and the second generation of the period from 42 to 70 days in their study on brown Japanese quail bird. It also differed with (Lehmood and Hadi, 2013) in The results of their study on Japanese quail bird showed that the average of egg production was 70.86%. The results did not agree with (Al-Tikriti, 2010) in his study on Japanese quail bird, where the fourth generation excelled on the first generation for the average egg production trait which amounted (79.54, 72.21%), respectively during the first 100 days of laying the first egg.

Egg Mass

Table (2) shows that there were significant differences (p≤0.05) in the trait of produced egg mass during the first 45 days of production. The early and medium groups excelled on the late groups. The egg mass for two generations (10.09, 9.89, 9.08 g / bird/ Day), respectively. The increase in egg mass in the early and medium group is due to increased egg production. This is also due to a negative Genetic and phenotypic correlation with high significant (p≤0.01) between two traits of the average age at sexual maturity and egg mass.The early selection of age trait at sexual maturity leads to an increase in the average egg mass of selected lines. These results agree with (Abou El-Ghar et al., 2007; Bahi El-Deen et al., 2008) in their study on Japanese quail bird. The results also agree with (El-Dlebshany, 2008) in their study on the laying hens (Alexandrian strain) and selected for the age trait at sexual maturity, where there was a significant superiority of the early groups on the medium and late groups in the egg mass during the first 90 days of production. The results of the study also agreed with (Camci et al., 2002; Bahi El-Deen et al., 2008; Al-Qaisi et al., 2016) on the effect of age trait at early, medium and late sexual maturity and late on the trait of the average eggs mass where the early age was the highest value in their study on the Japanese quail bird. The results also showed significant differences (p≤0.05) in the trait of egg mass between two generations study. The sons generation excelled on the parents' generation for the early, medium and late groups. It was observed that there was an increase in the average egg mass of the sons' generation for each of the three groups (early, intermediate and late) where Their values were (10.04, 10.13 and 9.70, 10.08 and 8.76, 9.41 g / bird / Day), respectively. Because the superiority obtained in the herd of sons resulting from the selection for age at sexual maturity for the trait of egg production with no significant differences in egg weight led to the superiority of the sons generation in the egg mass production, where it is known that the egg mass of is the sum of each of the eggs production and its weight, thus get this excellence for the sons generation. These results agree with the results of (Al-Tikriti, 2010) noted that the fourth-generation superiority on the first generation for the trait of average egg mass where its value was (913.32, 769.68 grams / bird /

100 days), respectively in its study on brown Japanese quail bird during the first 100 days of production. The results also agreed with (Al-Qaisi et al., 2016) on the effect of age trait at early, medium and late sexual maturity for the trait of average egg mass in the second generation compared to the first generation in their study on Japanese quail bird.

Feed Consumption

Table (2) shows significant differences (p≤0.05) in average of daily feed consumption. The results showed significant superiority of the early groups compared to the medium and late groups, while no significant difference was found between the medium and late groups where the average feed consumption for the early amounted to (28.46, 27.81, 27.78 g / day / bird), respectively. The excelling of early groups in the daily feed consumption is due to the fact that The need of birds to meet the needs of the body of nutrients as a result of increase the averages of egg production, many researchers indicated to a positive relationship between the amount of feed consumption and he increase in the percentage of egg production (Attieh, 2006).The decrease in the amount of feed consumed in medium and late groups is due to the lower of the average egg production in these groups compared with the early groups (Jassim, 2011).These results agree with (Al-Asadi, 2005; Jassim et al., 2006; Al-Tikriti and Al-Jumaili, 2013; Al-Qaisi., 2014). As shown in the table, there were no significant differences between the parents 'and sons' s generation for the early, medium and late groups. The daily feed consumption (83.28, 09.28 and 27.95, 27.67 and 27.83 and 27.74 g / day / bird), respectively.

Dietary Conversion Efficiency

Table (2) shows significant differences (p≤0.05) in the average dietary conversion efficiency. The results indicated that the early and medium age groups where indicated to improve in sexual maturity compared with the late groups in the trait of the average dietary conversion efficiency (g feed / g egg) which their average values of the two generations were (2.82, 2.81, 3.07 g feed / g egg), respectively. The early and medium groups were better in dietary conversion efficiency, This is due to the fact that females have begun to produce eggs and increase the weight of eggs rather than the increase in weight of meat production, which is reflected in the utilization of feed and conversion it into egg production (Hassan and Abdul Sattar, 2017). The results agree with the results of (Bahi El-Deen et al., 2008) in his study of age at sexual maturity on Japanese quail bird. It found that the average of dietary conversion efficiency in the early, medium and late groups within 45 days of age at sexual maturity (2.47, 2.86, 3.09 g feed / g eggs), respectively.The results also agreed with (Al-Qaisi et al., 2014) in their study of age at sexual maturity on Japanese quail bird. The average of dietary conversion efficiency of the early, medium and late groups was found within 70 days of age at sexual maturity (2.95, 3.10, 3.26 g feed / g egg), respectively. The results of the table showed that there was no significant difference in the average of dietary conversion efficiency between parents and sons in the three groups (early, medium and late). However, a better improvement was observed in the average of dietary conversion efficiency in the sons's generation than in the three groups, which were (2.87, 2.77 and 2.89, 2.74 and 3.18, 2.95 g feed / g eggs) in the early, medium and late groups of both parents and sons generation, respectively. This improvement in the average of dietary conversion efficiency of the sons generation is due to the increase in the percentage of egg production, meaning take advantage of the feed and turn it into egg production (Rezvannejad, 2013). This is also due to the presence of a negative Genetic and phenotypic correlation with high significant between the average of dietary conversion efficiency and average of egg production, so the better the dietary conversion efficiency, the higher eggs production (Jassim, 2011).

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CONFLICT OF INTEREST

This research is a personal non-profit work and there is no conflict of interest.

AUTHORS CONTRIBUTION

Samawal S.A. Al-Tikriti is responsible for animal, work and samples collection, responsible for data analysis, writing correction and proof reading.

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