OPEN ACCESS
Advances in Animal and Veterinary Sciences

Research Article

The Genetic Selection for Four Generations and its Effect on the Blood Biochemical Parameters in the White Quail

Samawal Sadi Abdullah Al-Tikriti

Department of Animal Production, College of Agriculture, University of Tikrit, Iraq.

Abstract | This study was conducted in the field of animal production of the college of Agriculture - University of Tikrit from 20/10/2012 until 20/6/2013, the herd was obtained from the General Authority for Agricultural Research in Abu Ghraib which affiliated to the Ministry of Agriculture. The average weight of males and females at five weeks old (150 and 178) grams respectively, with production percentage 70%, collection of eggs from the herd and hatched in a hatchery in the College mentioned above. The study aimed to determine the effect of selection after four generations of the Japanese quail in order to determine the changes in certain blood biochemical parameters. The results showed a significant decrease in the level of cholesterol, glucose, total protein, albumin, globulin and uric acid in the fourth generation compared to the other generations of each of the selected lines.

Keywords | Blood biochemical, White quail, Four generations

Editor | Kuldeep Dhama, Indian Veterinary Research Institute, Uttar Pradesh, India.
Received | October 19, 2018; **Accepted** | November 11, 2018; **Published** | December 29, 2018
***Correspondence** | Samawal Sadi Abdullah Al-Tikriti, Department of Animal Production, College of Agriculture, University of Tikrit, Iraq; **Email**: agricnano.egypt.2017@gmail.com
Citation | Al-Tikriti SSA (2019). The genetic selection for four generations and its effect on the blood biochemical parameters in the white quail. Adv. Anim. Vet. Sci. 7(3): 151-156.
DOI | http://dx.doi.org/10.17582/journal.aavs/2019/7.3.151.156
ISSN (Online) | 2307-8316; **ISSN (Print)** | 2309-3331

INTRODUCTION

The growing demand for poultry products, whether eggs or meat, which called on those interested in the poultry industry to seek ways to enable the expression of the full performance. The importance of quail as a result of possessing many qualities that distinguished him from the rest of the birds specialized in the production of eggs and meat and these qualities short generation period and its simple needs for space and capital and adapt to the various environmental conditions and resistance to many diseases that affect the rest of the birds (Kayang et al, 2004). It is also used in behavioral, developmental, physiological, genetic and biomedical studies (Balthazart et al., 2003) as well as the use of both adult and embryos extensively in studies as a model for vertebrates and for the study of human diseases (Huss et al., 2008), the appearance of any of the quantitative qualities in the animal affects the genetic composition of genetic makeup and environmental conditions, but the genetic factors remain constant throughout the life of the animal and passed through different generations so that the owner who wants to improve production in his herd must reach it from the manifestations of the qualities that can be measured, and the estimation of the genetic parameters that achieve its goal.

Selection is one of the means to improve domestic poultry, which needs a long time to reach the desired goal, so researchers have other ways to achieve a return as short as possible. To reduce the costs of poultry breeding and management at an early age through the use of genetic and enzymatic functions depending on the imported polymorphism (Al-Hadithy, 2002). The work started towards the possibility of benefiting from linking this phenomenon with the productive characteristics of the economic animals in quail, which is one of the genetic factors not yet diagnosed and provides a large base of information on the inheritance of quails, which settled the region for several centuries, so the goal of this research after the selection for four generations in the blood biochemical parameters of a white feathers quail.

MATERIALS AND METHODS

This study was conducted in the field of animal production of the college of Agriculture - University of Tikrit from 20/10/2012 until 20/6/2013. The study aimed to determine the effect of selection after the four-generation in the blood biochemical parameters of the Japanese quail. The main herd was obtained from the herd of the General Authority for Agricultural Research in Abu Ghraib and affiliated to the Ministry of Agriculture. The rate of weight of males and females at the age of five weeks (150 and 178) grams respectively, with production percentage 70%, collection of eggs from the herd and hatched in a hatchery in the College mentioned above.

The birds were fed on a diet with 22.84% protein and 2998 Kcal / kg of feed and 19.59% protein and 2753 kcal /kg of fed. Blood tests: 15 blood samples were taken after the jugular vein was cut from each bird at the end of the production period for each generation and the blood was placed in the tubes for blood tests. Deposited in the centrifuge for 15 minutes at 3000 cycles / minute for obtaining serum, which was separated and placed in sterile, clean and free of any material and kept at a temperature of - 20 m until the study of the biochemical tests according to the method mentioned by Campbell (1995). The biochemical parameters (cholesterol, glucose, total protein, albumin, albumin ratio / globulin and uric acid) were estimated using a biomeriux and plasmatic instruments, whereas the level of serum globulin was estimated by equation of Bishop et al. (2000) Level of globulin (gm / 100 ml) = total protein - albumin. The experiment was designed on the basis of a complete random design and the use of the statistical program (SAS, 2001) in the analysis of studied traits according to the following mathematical model.

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

As:

Yij = the observation value j for treatment i

μ = the general mean of the studied character

Ti = Effect of treatment i

eij = random error distributed by natural and independent distribution with an average of zero and an equal variation of $\sigma^2 e$.

The mean was measured by the Duncan Multiple Range Test (1955).

RESULTS AND DISCUSSION

Cholesterol

The results shown in Table 1 revealed that differences in concentration of cholesterol level were high among the study generations. The lowest concentration of cholesterol in the fourth generation was 179.54 mg / 100 ml serum while the highest concentration in the first generation was 221.32 mg / 100 ML serum while in both second and third generation cholesterol levels were187.29 mg / 100 ml serum.

The low concentration of cholesterol in blood of highly producing layer chicken was due to the tendency of cholesterol to form fat in the yolk and as an important material in the development of the fetus and also the need for cholesterol in the synthesis of female sex hormones and vitamin D3 and its importance in the transfer of fatty acids within the body. The concentration of cholesterol in relation to changes in metabolic activity associated with sexual maturity and is influenced by body weight at sexual maturity and physiological body condition (Al-Tikriti, 2014; Abbas et al., 2014; Abdul Sattar, 2016; Alijagic et al., 2017).

Marks et al. (1990) showed that the value of the heritability for the cholesterol concentration parameter in the lines produced for the low cholesterol concentration in their blood was 0.11 and 0.03 in the lines produced for the high concentration of cholesterol in their blood after eight generations of selection. Suggesting that the selection may be insufficient in lowering the concentration of cholesterol in the blood and eggs.

Glucose

Table (1) reveal the means and standard deviations and Covariance factor, for the parameter glucose level in serum, the results showed that there were significant differences among the four generations. The highest concentration of serum glucose level in the first generation and the lowest level in the fourth generation was 241.87 and 194.95 mg / 100 ml serum respectively and its level in the second and third generations were significant differences at 218.51 and 213.00 mg / 100 ml serum, respectively.

Low glucose concentration may be due to increased egg production with an inverse relationship between egg production and glucose levels in blood plasma. As the females produce eggs that have a negative effect on the level of glucose in the blood and glucose is an important source and essential in the synthesis of biological materials that enter into the synthesis of eggs and also glucose enters in converting to Acetate to the structure of carbon structure of non-essential amino acids that enter in synthesis of egg proteins as well as in synthesis of amino acids (Al-Mashayekhi, 2017). These results agreed with the data obtained by Al-Tikriti (2010) in his study of the Japanese brown quail selected for four generations.

Table 1 shows that the standard deviations and the covariance factor were in the control line was high in the

first and fourth generation (16.29 and 6.45%), (14.26 and 6.87%) respectively, while in the second and third generation it was low, which mean the Stabilizing the desired alleles and thus reducing the variations in the selected line until it reached a state of homogeneity of the herd in the remaining three generations (Falconer and Mackay, 1996).

Total Protein

Table 1 show that the total protein level in the four generations, regardless of the line for which it was selected, was higher in the first generation and lower in the fourth generation. The levels were 4.54, 4.16, 3.86 and 3.59 g / 100 ml serum for the first, second, third and fourth generations, respectively.

Protein plays a very important and vital role in the natural balance of the body and is a store of amino acids and transport many of the food compounds that cannot be transmitted, but it is linked, such as fats that pass the proteins Lipoproteins and some carbohydrates that are transported in protein carbohydrates glycoprteins (Sturkie, 1976). Protein can be an indicator of good health status when increasing its concentration in animal and human serum and a guide to producing abundant eggs because of most egg proteins are transported through the blood to the ovaries (Al-Hadithi, 2002). Al-Qaisi et al. (2016) reported that the selection of the least albumin content in the serum produces high-yielding eggs with ages with less sexual maturity. These results were also agreed with the data obtained by Jassem (2011) and Saber (2018) in their study on some of the biochemical characteristics of the Japanese brown bird, The concentration value of total protein level in serum (3.66 and 3.55) g / 100 ml serum respectively.

These results were not agree with the data obtained by Faisal et al. (2008) and Latif (2011) in their study of the selected Japanese quail for high and low body weight and for several generations. And did not agree with the results obtained by Deka and Borah (2008) and the Al-doori (2010) as the results of their study on the Japanese quail bird that the level of total protein in the serum was higher than the data obtained in this study.

Albumin

Table 1 shows serum albumin levels, standard deviation, and covariance factor. The data showed that there were significant differences in albumin level among the four generational levels. The first, second, third and fourth generation levels were 2.32, 2.17, 1.89, and 1.80 g / 100 ml, respectively. It is noted that the albumin level is lower than that of the first generation. In the first generation was the highest and the lowest was in the fourth generation.

These data were agreement with the findings of Raouf et al. (2016), Soliman et al. (2000), Abdel-Fattah et al. (2003) in their study of Japanese quail birds, finding that albumin concentrations ranged from 1.54 to 1.98 g / 100 ml serum. The improvement in the concentration of total albumin in the treatment group serum may be due to an improvement in the percentage of total protein as the albumin is the largest protein in the blood, which is the transfer of carbohydrates, fatty acids, vitamins and some mineral elements and thyroxine. Al-Tikriti (2014), Al-Tikriti (2018) and Al-doori (2010) showed that albumin reduction affects the blood concentration of the compounds transported by it. This is a sign of hypoproteinemia because the albumin protein is the main protein in the serum proteins of birds.

These data were agree with the findings of Faisal et al. (2008) in his study of some of the blood biochemical characteristics of Japanese quail selected for high bodybuilder, a low-body weight line and a control line. The results did not agree with Al-doori (2010) in his study on the Japanese quail bird, where it was found that the albumin level in the selected line of high and low body weight and line of control 153.12 and 142.75 and 143.37 grams / 100 ml serum, respectively. they did not agree with the results obtained by Al-Sheikhly (2011) in his study on some physiological and biochemical parameters in blood of Japanese quail bird.

The ratio of standard deviations and covariance factor was low in the fourth generation at 0.10 and 5.34%, respectively. This gives an indication that the selection worked on homogeneity of the herd and that the obtained from the selection would be few if selected with the same intensity (Falconer and Mackay, 1996). This means that the selection decreases the genetic variability and the rate of return when these alleles approach fixation due to the stabilization of all desired isolated alleles.

Globulin

Table (2) shows the levels of globulin for four generations. The results of the study showed that the first generation was superior to the second and fourth generations in the level of globulin, while the differences were insignificant between first and the third generation. The results also showed no significant differences between the second and third generations. The level of globulin was 2.22, 1.99, 1.97 and 1.79 g / 100 ml in serum, respectively.

The increase in the level of globulin's in the blood gives an indication of the increase in the antibodies in the blood of birds selected for low body weight because of an inverse relationship between egg production and high level of globulins as the production of eggs in the line of the selected body weight was lower than the line selected for high body weight. Therefore, the globulin's moved to the ovaries to enter the egg formation. These data were agree with the results of the study, Faisal et al. (2008), El-Hommosany (2008), Al-Tikriti (2014) and Agina et al. (2017) in their

Table 1: Cholesterol and Glucose andTotal protein and albumin, standard deviation and covariance factor of japanaese quail bird

Covariance factor %	Standard deviation ±	Mean	Generation	Parameter
11.20	26.12	221.32 a	first	Cholesterol
8.21	17.52	205.27 b	second	
8.78	16.12	187.29 c	third	
8.81	15.69	179.54 d	fourth	
12.00	25.55	241.87 a	first	Glucose
11.02	22.85	218.51 b	second	
12.48	24.89	213.00 c	third	
18.58	32.69	194.95 d	fourth	
9.85	0.49	4.54 a	first	Total protein
9.25	0.33	4.16 b	second	
9.95	0.37	3.86 b	third	
8.76	0.32	3.59 c	fourth	
9.57	0.14	2.32 a	first	albumin
7.12	0.13	2.17 b	second	
9.69	0.12	1.89 c	third	
9.74	0.15	1.80 d	fourth	

* Meanings within the column with different letters that differ significantly from each other (P <0.05)

study on some biochemical blood parameters in Japanese quail birds.

These results were not agree with the findings of both Deka, Borah (2008) and Saber (2018) in their study on some of the blood biochemical properties of the Japanese quail and reached 2.97 and 1.21 g / 100 ml blood levels, respectively. Table (2) shows that the covariance factor in the control line was high in the first generation 15.45%, in the fourth generation it decreased to 9.49% and the standard deviations were high in the first generation 0.37 and lower in the fourth generation 0.18. The results showed that the standard deviations and the covariance factor in the selected line for high body weight in the fourth generation were 0.13 and 8.32% lower than the rest of the generation's because of the selection lead to heterogeneity of the herd.

Albumins: Globulins Ratio

The results illustrated in Table (2) showed significant differences between the generations of the study regardless of the effect of the treatment on the parameter albumins: globulins ratio. The first and second generations were significantly higher than the third and fourth generation, 1.05, 1.09, 0.95 and 1.01 for the four generations. respectively.
The high albumins: globulins ratio indicate that they can be used as a genetic guide for early selection. The increase in their percentage indicates the increase in albumin, which gives an initial indication about the increase in egg production, while its low percentage gives a sign or indication of a large immune response and resistance. These results were agreement with the findings of El-Samra et al. (2000) and Al-Tikriti (2014) in their study of Japanese bird quail. It also agreed with the results obtained by Bahnas et al. (2009). The results showed that the selected lines of body weight were significantly higher than the control group for the trait albumins: globulins ratio.

Table (2) illustrated that the standard deviations and covariance factor in all different genotypes were low in the fourth generation compared to the first three generations. This gives an indication that the selection worked on homogeneity of the herd and the yield obtained would be minimal if they are selected by same intensity.

Uric Acid

It is noted from the data present in Table (2) that there are significant differences in the serum uric acid concentration as the first generation was superior of this parameter and reached 4.14 mg / 100 ml in serum over the other three generations, which were 3.93, 3.81 and 3. 53 mg / 100 ml in serum for the second, third and fourth generation, respectively.

The difference in concentration of uric acid between the genotypes is due to variation in the metabolic rate. Therefore, the concentration of uric acid is genetically positively correlated with the total protein. The levels of uric acid in the plasma of birds laying eggs are much lower than in non- egg laying birds, because most serum proteins are transferred to the egg to form egg proteins and egg yolks.

Table 2: The Globulin and Albumin: globulin ratio and Uric acid (gram / 100 ml serum), the standard deviations and the covariance factor of the Japanese quail bird

Covariance factor	Standard deviations	Mean	Generation	Parameter
13.06	0.31	2.22 a	first	Globulin
12.64	0.28	1.99 b	second	
13.15	0.28	1.97a b	third	
7.75	0.14	1.79 c	fourth	
17.54	0.21	1.05 a	first	Albumin: globulin ratio
15.32	0.15	1.09 a	second	
13.10	0.14	0.95 b	third	
11.14	0.11	1.01 b	fourth	
7.62	0.26	4.14 a	first	Uric acid
6.29	0.29	3.93 b	second	
6.44	0.20	3.81 c	third	
10.14	0.35	3.53 d	fourth	

* Meanings within the column with different letters that differ significantly from each other (P <0.05)

A significant proportion of these proteins in non-egg-laying birds will be break down and released in the form of Uric acid is the main compound of metabolites of proteins in birds (Al-Sudanee et al., 2012). These results were not agreed with Saber (2018), which concludes that the level of uric acid in the blood of Japanese bird quail was 5.27 mg / 100 ml blood.

ACKNOWLEDGEMENTS

I would like to thank The College of Agriculture, University of Tikrit for giving me this opportunity to express my science.

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.

REFERENCES

- Abbas, Ahmed Abdullah, Thamer Karim Al Janabi, Maysa Ahmed Nasser (2014). Determination of the genetic and phenotypic features of the cholesterol and total protein levels in the serum of quail bird. Karbala Scient. J. 12(2): 162-168.
- Abdel-Fattah SA, YM El-Hommosany, Maie FM Ali (2003). Response of quail chicks to different quantitative feed restriction regimens: productive , immunological and physiological aspects. Egypt. Poult. Sci. 23 (2) : 421-440.
- Abdul Sattar, Ali Rafie (2016). Studying the production performance of three breeds of Japanese quail during autumn and spring in Iraq. Master Thesis . college of Agriculture, Diyala University.
- Agina OA, Wilfred S Ezema, Ezinwa M Iwuoha (2017). The haematology and serum biochemistry profile of adult japanese quail (coturnix coturnix japonica). Not. Sci. Biol. 9(1):67-72. https://doi.org/10.15835/nsb919928
- Al-doori, Omar Issam Abdullah (2010). Effect of body weight on some productive and physiological qualities in the Japanese quail bird. Master Thesis - college of Agriculture - University of Tikrit.
- Al-Hadithi, Ahmed Tayes Taha (2002). Study of the various forms of certain proteins and blood enzymes of Iraqi chicken breeds. Master Thesis - college of Agriculture - University of Baghdad.
- Al-Mashayekhi, Mays Kilan, Hamid Hassan (2017). Effect of the addition of vitamin C and aspirin and different levels of amla powder in the physiological and productive performance of the quail fowl in warm climates. Master Thesis - college of Agriculture - University of Tikrit.
- Al-Sudanee, Salah Mohsen and Al-attar, Ali Abdul Karim and Ayed, Asaad Yahya (2012). The effect of the selection on the efficiency of food conversion in some parameters of the Japanese quail (Coturnix Coturnix Japonica). Kufa J. Agric. Sci. 4 (2): 180-188.
- Al-Sheikhly, Abdul Rahman Fouad, Abdel Rahman (2011). Effect of adding coriander seeds. Coriandrum sativum L in the ration on the production performance and some of the physiological characteristics of the birds of Salwa. Master Thesis - college of Agriculture - University of Tikrit.
- Alijagic A, E Islamagic, M Focak, D Suljevic (2017). Effects of trivalent and hexavalent dietarychromium on blood biochemical profile in japanese quails. Bulgarian J. Vet. Med.1-8 .
- Al-Tikriti, Samawal Sadi Abdullah (2010).Constructing Some of Selection Indices For Coturnix Coturnix Japonica Productive Performance and Physiological Characters, PhD thesis, college of Agriculture, University of Tikrit, Iraq.
- Al-Tikriti, Samawal Sadi Abdullah (2014). Determination of the genetic features of some of the biochemical parameters

of the black Japanese quail. Euph. J. Agric. Sci. (3): 93-100.
- Al-Tikriti, Samawal Sadi Abdullah and Al-Doori, Abdul Haq Ismail Jassem (2018). The effect of the addition of *Ganoderma lucidum* powder with different levels in some of the biochemical parameters of the Japanese quail. Tikrit Journal of Agricultural Sciences. Seventh Int. Conference Agric. Res.: 722-728.
- Al-Qaisi, Haitham Rajab Menahi, Bashir Taha Omar al-Tikriti, Samawal S, A Al-Tikriti (2016). The selection of age at sexual maturity and its relation to some of the productive traits in brown Japanese quail bird. Tikrit University J. Agric. Sci. 16 (2): 146 - 152.
- Bahnas MS, Ragab MS, Asker NA, Emam RMS (2009). Effects of using parsley or its by- product with or without enzyme supplementation on performance of growing Japanese quails. Egypt Poult. Sci. 29(1) : 241-262 .
- Balthazart J, Baillien M, Charlier TD, Cornil CA, Ball GF (2003). The neuroendocrinology of reproductive behavior in Japanese quail. Domest. Anim. Endocrinol. 25: 69–82. https://doi.org/10.1016/S0739-7240(03)00046-8
- Bishop ML, Dube-Engerlik JL, Fody EP (2000). Clinical Chimistr: Principles, Correlation's, Procedures. 4th ed. Philadelphia. Pp. 405-416.
- Campbell TW (1995). Avian Hematology and Cytology 2nd Ed. Lowa State Press A Black well Publishing Company.
- Deka K, J Borah (2008). Heamatological and biochemical changes in japanede quails Coturnix Coturnix Japonica and chickens due to Asbaridia galli infection. Int. J. Poult Sci.7(7) : 704-710. https://doi.org/10.3923/ijps.2008.704.710
- Duncan DB (1955). Multiple range and multiple F-test - Biometeics. 11:1-42.
- Edward CN (1976). The cholesterol problem , the egg and lipid metabolism in the laying hens. Poult. Sci. 55 : 14-30. https://doi.org/10.3382/ps.0550014
- El-Hommosany YM (2008) . Study of the physiological changes in blood chemistry , humoral immune response and performance of quail chicks fed supplemental chromium. Int. J. Poult. Sci. 7(1): 40-44. https://doi.org/10.3923/ijps.2008.40.44
- El-Samra A, Salwa GKG, AE Abou-Zeid, HS Zeweil (2000) . Nigella sativa seed oil meal as a nontraditional source of plant protein in Japanese quail diets Egypt. Poult. Sci. 21(1) : 107-125 .
- Falconer DS, Mackay TFC (1996). Introduction to quantitative genetics -4th E d. (London , Longman).
- Faisal BA, SA Abdel-Fattah, YM El-Hommosany, Nermin, M Abdel-Gawad, Maie FMA (2008). Immunocompetence, hepatic heat shock protein 70 and physiological responses to feed restriction and heat stress in two body weight lines of Japanese quail. Int. J. Poult. Sci. 7(2) : 174-183. https://doi.org/10.3923/ijps.2008.174.183
- Huss D BS, Poynter BS, R Lansford (2008). Japanese quail (Coturnix japonica) as a laboratory animal model. 37(11) : 513-519.
- Jassem, Ahmed Moayad (2011). The effect of the genetic group and the level of the diet protein in some of the productive traits of the Salwa. Master Thesis - college of Agriculture - University of Mosul.
- Kayang BB, A Vignal, M Inoue-Murayama, M Miwa, JL Monvoisin, S Ito, F Minvielle (2004). A first-generation microsatellite linkage map of the Japanese quail . Int. Societ. Anim. Genet. 35: 195–200. https://doi.org/10.1111/j.1365-2052.2004.01135.x
- Latef Esraa, Azeez Ezzat (2011). The Effect of crossbreed between Selected Salwa Lines Based on Body Weight in a Number of Production and Physiological Characteristics, Master Thesis, college of Agriculture, University of Tikrit, Iraq.
- Marks HL, HS Siegel, JW Latimer (1990). Plasma cholesterol response to ACTH in Japanese quail following eighteen generation of divergent selection . Poult. Sci. 69: 205-208. https://doi.org/10.3382/ps.0690205
- Raouf, Samah Mayser , Taha Ahmed, Tayes Hassan, Makhlid Oreibi (2016). Effect of the use of the water extract of Ulphera and vitamin C on some physiological traits in the female Japanese bird. J. Zagazig. 34 (2).
- Saber, Asaad diaa (2018). Effect of adding yucca aloifolia powder to feed quail birds on production performance and some physiological characteristics. Master Thesis . college of Agriculture, University of Tikrit.
- SAS (2001). SAS/ STAT User's Guide : Statistics Version 6.12 Edition. SAS. Institute Inc., Cary, NC. USA .
- Soliman FNK, A El-Sebai, M Abaza (2000) . Hatchability traits of different colored Japanese quail eggs in relation to egg quality and female blood constituents . Egypt Poult. Sci. 20(2): 417-430 .
- Sturkie PD (1976). Blood physical characteristic formed lementshemoglobin, page 54: Avian Physiology . Springer – rlag . New York . NY.