Plant Archives Vol. 19, Supplement 2, 2019 pp. 1520-1524 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF THE OPA-16 MARKER ON SOME PRODUCTION CHARACTERISTICS OF THREE DIFFERENT STRAINS OF DUCKS

Iman H. Al - Anbari[1], Hani H. Al - Saidi[2], Ali H. Al - Hilali[3] and Jassem Q. Al - Gharawi[3]

[1]Faculty of Agricultural Engineering Sciences, University of Baghdad, Iraq

[2]Technical Institute Shatrah, Iraq

[3]College of Agriculture, University Al-Muthanna, Iraq

Abstract

The study was conducted at the Poultry Field in the Faculty of Agriculture / Al-Muthanna University for the period from 29 December 2017 to 6 of April 2018 to investigate the effect of the marker OPA-16 on some production characteristics of three strains of ducks (Muscat, Pekin, and local ducks). In this study, 75 sexed ducks at the age of 1 day were used and 10 chicks (5 males and 5 females) were taken from each strain. The chicks were provided from the local markets and reared in a closed hall with dimension of 10 x 45 m. The hall was divided into three parts using a plastic barrier to isolate each strain separately, the birds were numbered by plastic numbers placed in the legs of the bird. The experiment was lasted for 12 weeks, and the studied traits were production characteristics which included weekly average body weight, weekly weight increase, weekly feed consumption, weekly feed conversion coefficient and carcass characteristics which involved (dressing percentage with and without edible giblet, relative weight of heart, liver and gizzard). The obtained results revealed a significant ($P < 0.05$) superiority in genotype (1081/273, 1081/316) of Pekin strain compared with genotype (1081/344, 965/327) of Muscat strain and the genotypes (1142/339, 1184/361) of local ducks strain for both the total feed consumption rate and the total feed conversion coefficient. Additionally, the genotypes (1081/344) of Muscat duck males was superior ($P < 0.05$) on the genotypes (965/327) of Muscat duck females in total feed consumption rate and total feed conversion coefficient. As well, the genotypes (1081/273) of Pekin ducks males was superior on the genotypes (1081/316) of Pekin ducks females in the total feed consumption rate while in the dressing percentage (with and without edible giblet), the genotypes (1142/339, 1184/361) of local ducks was significantly superior ($P<0.05$) on the genotypes (1081/344, 965/327) and (1081/273, 1081/316) of Muscat and Pekin strains respectively. The obtained results showed the possibility of taking advantage of studying the relationship between genetic markers and the productive qualities in different types of ducks and it is beneficial effect on the early selection programs of chicks, especially for the local ducks that showed a high dressing percentage with or without edible giblet.

Keywords: OPA-16 Marker, production characteristics, Muscat ducks, Pekin ducks, local ducks.

Introduction

Ducks are birds that are capable of rapid production of animal protein. Their meat content is less than 20% of animal protein (Douglas *et al.*, 1988). The duck production industry is similar to chicken production projects. It is intensively cultivated in private fields for meat production or eggs (Byron, 2003). World production of ducks has doubled in recent decades from 1993 to 2005, and meat production has risen from 1.72 to 3.45 million tons. Poultry meat in Asia is mainly dependent on Pekin ducks in China, Muscat and Indian sprinter in Taiwan (FAO, 2017). The main types used for breeding are the Muscat, the Pekin and the mule duck (hybrid between the Muscat and the pekin), which are raised in France for the production of fatty liver, 97% of the ducks in this country produce fatty liver (Adzitey, 2011). Several methods were used to select the chicks of ducks and the selection was mainly based on using traditional methods of external appearance, election of one or more economic characteristics, or using the correlation equations and regression of economic characteristics (AL-Anbari, 2015). Then, molecular studies emerged that relied on the coagulation device and the use of cutaneous enzymes (AL-Anbari, 2018) and morphological markers that were among the oldest markers used and followed by chromosome markers, biochemical markers, Molecular Markers, which rely mainly on genetic material (DNA). These techniques are used in the selection and in external rearing and the degree of genetic symmetry within the strain. The study also investigates the associations between the multiple genotypes with their productivity and their utilization in the selection and improvement processes (Biscarini *et al.*, 2015). Due to the importance of aquatic birds, especially ducks in Iraq, the present study was conducted to determine the effect of OPA-16 Marker in some productive characteristics of three strains of ducks (Muscat, Pekin and local ducks).

Materials and Methods

This study was carried out at the Poultry Field in the Faculty of Agriculture / Al-Muthanna University for the period from 29 December 2017 to 6 of April 2018 to investigate the effect of the marker OPA-16 on some production characteristics of three strains of ducks (Muscat, Pekin, and local ducks. In this study, 75 sexed ducks at the age of 1 day were used and 10 chicks (5 males and 5 females) were taken from each strain. The chicks were provided from the local markets and reared in a closed hall with dimension of 10 x 45 m. The hall was divided into three parts using a plastic barrier to isolate each strain separately, the birds were numbered by plastic numbers placed in the legs of the bird and the experiment lasted for 12 weeks.

The studied attributes

The average of live body weight (g), dressing percentage and carcass characteristics: The chicks were weighed weekly and individually from one day to the end of the experiment (12 weeks) to calculate the average weekly weight of the birds and weekly weight increase, according to Zubaidi (1986). At the end of the experiment, the average weight of six birds (3 males and 3 females) of each treatment (12 weeks) was selected after taking the live weight of each then, were slaughtered and the feathers, head, and legs were removed. The carcasses were cleaned from the internal intestines thoroughly and then weighed individually to calculate the dressing percentage without internal viscera,

and with edible giblet (heart, liver, and gizzard), according to Fayadh and Naji, (2012) as shown in the following equation:

Dressing percentage = [Carcass weight without edible giblet (g) / live body weight] x100

Relative weight of internal intestines: After isolating the internal organs (liver, heart and gizzard), the ratio of each was calculated according to the following equation:

Relative weight of internal organs (%) = [Internal organ weight (g) / carcass Weight (g)] x 100

The relative weight of carcass carcasses: After carcasses weighing to calculate the dressing percentage, the carcass was cut into major pieces, which included chest, thigh, and groin, and minor pieces (back, wings, and neck), according to Fayyad and Naji (2012). Each piece was weighed separately and the ratio of the weight of the pieces of the weight of the cleaned carcass was calculated according to the following equation:

Relative carcass weight (g) = [carcass carcasses / Weight of the cleaned carcass (g)] x 100%

Marker RAPD: The marker OPA-16 was selected to determine their relation to some of the productive properties in ducks. The degree of annealing correlation was determined by sequential sequence in the template DNA for each name using a temperature-specific process of naming.

Statistical analysis: The data were statistically analyzed in a factorial Experiments using Completely Randomized Design (CRD) using SPSS (2009) with the OPA-16 genotype in the studied traits. Morphological differences were compared between the averages using the Duncan (1955) Multidimensional Test.

Results and Discussion

The effect of genotypes of the OPA-16 marker on the final body weight and total weight gain

Table (1) shows the association of the OPA-16 marker with the final body weight and total weight increase of three strains of Muscat, Pekin and local ducks, indicating a significant superiority (P <0.05) of the genotypes (1081/227, 1081/316) of the pekin strain in the final body weight rate and the increase of weight as well as these genotypes was superior on genotypes (1142/339, 1184/361) of the local ducks and genotypes (1081/344, 965/327) of the Muscat ducks on genotypes (965/327) in the final body weight rate and total weight gain (Table 1). The table also indicates the superiority of the genotypes (1081/344) in males of Muscat ducks on the genotypes (327/965) in the females of Muscat duck in the final body weight and total weight increase in the 12-week breeding period. The obtained results detected that genotypes (1081/227) in the males of the Pekin ducks was significantly superior on the genotypes (1081/316) in the females of the Pekin ducks. Furthermore, a significant superiority (P <0.05) was noted in the genotypes (1142/339) of males in the local duck on the genotypes (1184/361) of females in the local duck and for the same traits above.

Table 1 : Effect of markers on the final body weight rate and total weight increase of Muscat, Pekin and local strains of ducks.

Strain	Sex	Genotypes	Final body weight rate	Total weight increase
Muscat ducks	Males	1081/344	97.19±2343.00Ba	±2298.80Ba86.66
	Females	0965/327	92.28±1511.60Cb	±1467.20Cb67.54
Average			61.38±1927.30C	±1883.00C55.19
Pekin ducks	Males	1081/227	88.37±3736.80Aa	±3691.40Aa97.46
	Females	1081/316	82.43±3185.40Ab	±3140.20Ab90.04
Average			56.49±3460.10A	±3415.30A88.50
Local ducks	Males	1142/339	69.22±2345.40Ca	±2295.60Ba75.47
	Females	1184/361	82.55±2152.00Bb	±2103.20Bb65.43
Average			55.38±2242.70B	±2199.40B57.33

[a,b,c]The different small letters vertically indicate that there were significant differences between the average of the sex levels within the single line below 0.05, (A, B): The different capital letters are vertically indicating that there are significant differences between the average of the breeds within the same gender under 0.05, The interaction between strain and sex was not significant for all traits.

The results indicated that the Pekin ducks was superior and for both sexes on the Muscat ducks and local ducks in the average of live body weight. This may be due to differences in in genetic susceptibility among species of birds (Huang *et al.*, 2006). Also, it can be attributed to the differences in the systems of growth hormone secretion in the Pekin duck, which leads to the achievement of high weights, which leads to high weights (Kosba *et al.*, 1997). The results showed the superiority of the Pekin ducks in growth until the end of the experiment which may be attributed to the conduct of election and improvement processes to achieve the best marketing in economical age where the genetic equivalent of body weight in ducks is 0.33 (Seo *et al.*, 2016). The obtained results were consistent with finding of Bochno *et al.* (2005) who found that the rate of growth in water birds varies by species, which in turn leads to a difference in the rates of body weight. As for the weight increase, the result detected that males of Pekin ducks were superior on their females during the 12-week breeding period. These results were consistent with Cheng *et al.* (1995). This was due to the effect of genes specific to sex which related to male hormones founded in larger quantities in males. Males start from the first week of breeding as opposed to the Muscat ducks as males superiority begins in the sixth, tenth and twelfth weeks of breeding period.

Effect of genotypes OPA-16 on the total feed consumption and total feed conversion coefficient (g feed/g weight increase)

Table (2) shows a significant superiority in the genotypes (1081/273 and 1081/316) of the pekin ducks on the genotypes (1081/344, 965/327) of the Muscat ducks and genotypes (1142/339, 1184/361) of the local ducks for total feed consumption (G) and total feed conversion coefficient (g feed/g weight increase) in addition to a significant superiority was noted in the genotypes (1142/339, 1184/361) of local ducks on the genotype (/ 1081 , 327 / 965) of Muscat strain and for the same traits above and for 12 weeks. The result of

the present study showed a significant superiority in the genotypes (1081/344) of Muscat strain males on the genotypes (965/327) of Muscat strain females in the total feed consumption. In regard with total feed conversion coefficient, a significant superiority was revealed in the genotypes (1081/344) of Muscat strain males on the genotypes (965/327) of the Muscat strain females. Significantly, the genotypes (1081/227) in the males of the pekin strain was superior on the genotypes (1081/316) in the females of pekin strain for the total feed consumption ratio (g) and the total feed conversion coefficient (g/g). The genotypes (1184/361) in the females of local ducks were significantly ($P < 0.05$) higher value than genotypes (1142/339) in the males of the local ducks for the total feed consumption (g) as well as the genotypes (1142/339) in the males of Local ducks were significantly ($P < 0.05$) higher than genotypes (1184/361) in the females of local ducks for the total feed conversion coefficient.

Table 2 : Effect of the markers on the total feed consumption rate and total feed conversion coefficient of Muscat, Pekin and local strains of ducks.

Strain	Sex	Genotypes	Total feed consumption (g)	Total feed conversion (g/g)
Muscat ducks	Males	1081/344	97.19±2343.00Ba	±2298.80Ba86.66
	Females	0965/327	92.28±1511.60Cb	±1467.20Cb67.54
Average			61.38±1927.30C	±1883.00C55.19
Pekin ducks	Males	1081/227	88.37±3736.80Aa	±3691.40Aa97.46
	Females	1081/316	82.43±3185.40Ab	±3140.20Ab90.04
Average			56.49±3460.10A	±3415.30A88.50
Local ducks	Males	1142/339	69.22±2345.40Ca	±2295.60Ba75.47
	Females	1184/361	82.55±2152.00Bb	±2103.20Bb65.43
Average			55.38±2242.70B	±2199.40B57.33

(a,b,c).The different small letters vertically indicate that there were significant differences between the average of the sex levels within the single line below 0.05; A, B: The different capital letters are vertically indicating that there are significant differences between the average of the breeds within the same gender under 0.05; The interaction between strain and sex was not significant for all traits.

Insignificant effect of the interaction between sex and strain for feed consumption for all the experimental periods. The obtained results of the experiment indicated that the Pekin ducks consumed higher feed than the local duck, which in turn exceeded the Muscat ducks which may be due to the genetic susceptibility or behavior of the birds in the consumption of feed (Bley and Bessei 2008). The weekly increase in the feed consumption of Pekin ducks may be attributed to the genetic susceptibility of these birds (Onba *et al.*, 2014). Also, the superiority of males on females in the feed consumption may be attributed to the rate of feed consumption in the males are larger than females and may be due to growth hormone in males higher than females (Biesiada-Drazazga *et al.*, 2012).

For feed conversion coefficients, the finding of the present study was consistent with finding of Marie-Etancelin *et al.* (2008) who observed a significant improvement in the feed conversion coefficient of males ducks compared to females. They also agreed with the findings of Solomon *et al.*, (2006), who found that the pekin ducks were significantly higher than the Kunshan ducks and the Muscat ducks in the feed conversion coefficient, as well as the weight of males heavier than the females ($P < 0.05$) at the slaughter age. Male weights value were 2426 g and 2491 g and females 2315 g and 2323 g. The superiority of males on females in the conversion efficiency of feed was attributed to the high speed of male metabolism due to the interaction between the androgen and thyroxine hormone. This superiority may be due to variations in genotypes among them and susceptibility to rapid growth, since the ability to metabolism is positively correlated with the rate of growth (Bochno *et al.*, 1994). The results showed that the pekin ducks and the local ducks were superior to the Muscat ducks in the second week of breeding. In the fourth week, the Muscat ducks were significantly superior ($P < 0.05$). Furthermore, the results showed that the pekin ducks were superior to the Muscat and local ducks in weeks 6 and 8 of the breeding period. In weeks 10 and 12 the Muscat strain was superior to the pekin and local ducks in addition to low feed conversion coefficient was detected in all strains of ducks and for both sexes which confirm the importance of marketing time before week 12 because the breeding at this period become uneconomical.

Effect of genotype of the OPA-16 on the dressing percentage with or without edible giblet

Table (3) indicates a significant superiority ($P < 0.05$) of the genotypes (1142/339, 1184/361) in the local ducks strain on the genotypes (1081/344, 965/327) in the Muscat duck strain and the genotypes (1081/273, 1081/316) in the pekin strain in dressing percentage with or without edible giblet. In addition, the superiority ($P < 0.05$) of the genotypes (1081/344) in males of Muscat ducks on the genotypes (965/327) in the females of the Muscat ducks was detected in dressing percentage with or without edible giblet (Table 3). Similarly, the genotypes (1081/273) in the males of pekin strain were significantly ($P < 0.05$) superior on the genotypes (1081/316) in the females of pekin ducks in dressing percentage with or without edible giblet. Furthermore, a significant superiority ($P < 0.05$) in the genotypes (1184/361) in the females of local strain on the genotypes (1142/339) in the males of the local ducks was revealed in dressing percentage with or without edible giblet and for 12 weeks.

Table 3 : Effect of markers on the dressing percentage with or without edible giblet of Muscat, Pekin and local strains of ducks

Strain	Sex	Genotypes	Dressing percentage without edible giblet	Dressing percentage with edible giblet
Muscat ducks	Males	1081/344	1.53±67.17Ba	1.55±72.81Ba
	Females	965/327	1.53±68.80Cb	1.55±74.63Bb
Average			1.08±67.99B	1.10±73.72AB
Pekin ducks	Males	1081/227	1.53±66.12Ca	1.55±71.12Ba
	Females	1081/316	1.53±69.55Bb	1.55±74.95Bb
Average			1.08±67.84B	1.10±73.04B
Local ducks	Males	1142/339	1.53±69.36Ab	1.55±74.87Ab
	Females	1184/361	1.53±72.82Aa	1.55±79.11Aa
Average			1.08±71.09A	1.10±76.99A

(a, b, c). The different small letters vertically indicate that there were significant differences between the average of the sex levels within the single line below 0.05; A, B: The different capital letters are vertically indicating that there are significant differences between the average of the breeds within the same gender under 0.05; The interaction between strain and sex was not significant for all traits.

The results of Table 3 showed a significant superiority in the females of the local ducks on males in the dressing percentage without the edible giblet %, the relative weight of the heart, the relative weight of the liver, the relative weight of the gizzard and dressing percentage with the edible giblet % while the obtained result indicated that a significant superiority in the females of the pekin ducks strain on their males was demonstrated in dressing percentage without the edible giblet % and relative weight of the liver %. As for the Muscat strain, the females were superior in the relative weight of the gizzard while the males were superior in dressing percentage with the edible giblet % and the relative weight of the liver. These results were not in agreement with Omojola (2007) who reported that males of pekin ducks were superior on their females in the weight of the liver, heart and gizzard. However, the obtained result was agreed with Hetzel (1983) who found that the percentage of internal organs weight increases with age. Additionally, the results indicated that the effect of the strain on the dressing percentage without the edible giblet was found where the local ducks have significantly exceeded the Pekin and Muscat strains which may be attributed to the strong correlation between the body weight and cleaned carcass weight (Musa, 1996). These results differ with finding of Abbas (2001) who reported that the strain had a significant effect on the weight of the cleaned carcass. The pekin ducks strain were superior to the local ducks in the average weight of cleaned carcass. While the effect of the strain on the relative weight of the gizzard, the relative weight of the heart, and dressing percentage with the edible giblet was detected where the local and Muscat ducks strains were superior on the pekin ducks. As for the relative weight of the liver %, the pekin strain was exceeded the local and Muscat strains. The obtained result was in agreement with finding of Tahir *et al.*, (1994) who indicated that there was no significant difference between the Iraqi strains of ducks and the pekin ducks. Bochno *et al.*, (2007) reported that the high dressing percentage associated with heavy genotypes as well as the dressing percentage in ducks was significantly higher than broiler chicken (Omojola *et al.*, 2004).

References

Abbas, R.J. (2001). Effect of slaughter age on carcass weight, body measurements and slaughter of domestic and Balkan ducks. Journal of Veterinary Medicine, 11(3): 63-75.

Adzitey, F. and Adzitey, S.P. (2011). Duck Production: Has a Potential to Reduce Poverty among Rural Households in Asian Communities–A Review. J. World's Poult. Res. 1(1): 7-10.

AL-Anbari E.H. (2015). Study the correlation and regression equation for som economic traits on Broiler Ross 308 fed on nutrition with different levels of Parsley oil. International Journal of Development Research. 5(1): 3717-3720.

AL-Anbari, E.H. (2018). Investigation of economic traits on the hybrid broiler (Ross 308) differing genotypically for insulin gene hormones using correlation and regression coefficients. Journal of Research in Ecology.6 (2): 2016-2023.

Biesiada-Drzazga, B.; Gruzewska, A.; Charuta, A.l Litwa, M. and Nasilowska, A. (2012). Study on growth body conformation and slaughter value of STAR 53 HY ducks. Rocz. Nauk. Zoot., 39: 225-235.

Bley, T.A.G. and Bessei, W. (2008). Recording of individual feed intake and feeding behaviour of Pekin Ducks kept in Groups. Poultry Science 87: 215.221.

Bochno, R.; Lewczuk, A. and Wawko, E. (1994). Comparison of growth and feed conversion efficiency of Muscovy and Pekin ducks, Poultry Abstract 1994 Volume 20. Number3, 18 CAB International.

Bochno, R.; Brzozowski, W. and Murawska, D. (2005). Agreiated changes in the distribution of lean, fat with skin and bones in duck carcass. Br. Poult. Sci., 46: 199-203.

Bochno, R.; Brzozowski, W. and Murawska, D. (2007). Prediction of meatiness and fatness in ducks by using a skin slice with subcutaneous fat and carcass weight without skin. Poult. Sci., 86: 136-141

Byron, S. (2003). Introduction to commercial duck farming. Livestock Officer (Poultry), Goulburn.

Cheng, Y.S.; Rouvier, R.; Poivey, J.P. and Tai, C. (1995). Genetic parameters of body weight, egg production and shell quality traits in the Brown Tsaiya laying duck. Genet. Sel. Evol. 27: 459–472.

Douglas, H.J. and James, W.G. (1988). Determinants of Breeding Distributions of Ducks. Wildlife Monographs. 35: 29-37.

Duncan, D.B. (1955). Multiple range and multiple F. test. Biometrics, 11: 1- 42.

FAO (2017). Food and Agriculture Organization of The United Nations Statistics Division database.

Fayyad, H.A.A. and Saad, A.H.N. (2012). Poultry Products Technology - Second Edition - Ministry of Higher Education and Scientific Research - Baghdad.

Hetzel, D.J.S. (1983). The growth and carcass characteristics of crosses between Albio and Tagel ducks and Muscovy and pekin drakes. Br. Poult. Sci., 24: 558-563.

Huang, Y.; Zhao, Y.; Haley, C.S.; Sh. Hu; Hao, J.; Wu, Ch. and Li, N. (2006). A Genetic and Cytogenetic Map for the Duck (*Anas platyrhynchos*). Genetics. 173(1): 287–296.

Kosba, M.A.; Negm, H.M. and El-Sayed, T.M. (1997). Selection for breast meat weight of ducks. Proceeding of the 11th European symposium on waterfowl. September 8-10, Nantes, 348-352.

Marie-Etancelin, C.; Chapuis, H.; Brun, J.M.; Larzul, C.; Mialon-Richard, M.M. and Rouvier, R. (2008). Genetics and selection of mule ducks in France: A review. World's Poult. Sci. J. 64:187–207.

Moussa, R.K. (1996). Studying some of the productive characteristics of local and Peking duck and their mixture under local conditions. Ph.D. thesis, University of Basrah, Faculty of Agriculture.

Omojola, A.B. (2007). Carcass and organolephtic characteristic of duck meat as influenced by breed and sex. Poult. Sci., 6(5): 329-334.

Omojola, A.B.; Adesehinwa, A.O.K.; Madu, H. and Attah, S. (2004). Effect of sex and slaughter weight on broiler chicken carcass. Food Agriculture and Environment. 2: 61-63.

Onba, E.E.; Erdem, S.E.; Hacan, O. and Yalcın, S. (2014). Effects of breeder age on mineral contents and weight of yolk sac, embryo development, and hatchability in Pekin ducks. Poultry Science, 93: 473–478.

Seo, D.; Bhuiyan, M.Sh.A.; Sultana, H.; Heo, J.M. and Lee, J.H. (2016). Genetic Diversity Analysis of South and East Asian Duck Populations Using Highly Polymorphic Microsatellite Markers. Asian-Australas J Anim Sci., 29(4): 471–478.

Solomon, J.K.Q.; Austin, R.; Cumberbatch, R.N.; Gonsalves, J. and Seaforth, E. (2006). A comparison of live weight and carcass gain of Pekin, Kunshan and Muscovy ducks on a commercial ration. Livestock Research for Rural Development 18(11): 117-123.

SPSS (2009). Statistical package for social sciences Version 16.

Tahir, M.A.; Pitan, M.H. and Hanna, S.S. (1994). Live body weight, dress, off Items and Carcass yield of chicken Broilers, Duck and Geese. Basrah J. Agric. Sci., 7(1): 13-23.

Zubaidi, S.S.A. (1986). Poultry Management. University of Mosul Press.