



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

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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 hall as closed system. 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 bird legs. The experiment was lasted for 12 weeks and the studied traits were measured including 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 ($P < 0.05$) 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 significant ($P < 0.05$) differ on 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.

Key words: 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 and Mohamed, 2017). Then, molecular studies emerged that relied on the coagulation device and the use of cutaneous enzyme 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 (AL-Anbari, 2018). 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 × 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 gain, 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:

$$\text{Dressing percentage} = \frac{\text{Carcass weight without edible giblet (g)}}{\text{live body weight}} \times 100$$

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:

$$\text{Relative weight of internal organs (\%)} = \frac{\text{Internal organ weight (g)}}{\text{carcass Weight (g)}} \times 100$$

The relative weight of cuts and carcass: After carcasses weighing to calculate the dressing percentage,

the carcass was cut into major pieces, which included breast, thigh, groin and minor pieces (back, wings and neck), according to Fayyad and Naji, (2012). Each piece was weighed separately and the ratio of weight of the pieces of the weight of the cleaned carcass was calculated according to the following equation:

$$\text{Relative carcass weight (g)} = \frac{\text{carcass carcasses}}{\text{Weight of the cleaned carcass (g)}} \times 100$$

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

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.

The results indicated that the Pekin ducks was differ significantly for both sexes on Muscat ducks and local ducks in the average of live body weight trait. This may be due to differences in genetic susceptibility among species of birds (Huang *et al.*, 2006). Also, it can be attributed to the differences in the systems of growth

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

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

a,b, small letters vertically indicate to significant $p>0.05$ differences between average of sex within breed (A, B): capital letters vertically indicating that there are significant $p>0.05$ differences between the average of the breeds within the same gender, interaction between strain and sex was not significant.

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

a,b,c, Small letters vertically indicate to significant $p>0.05$ differences between average of sex within breed A, B: capital letters indicating to significant $p>0.05$ differences between the average of the breeds within the same gender; the interaction between strain and sex was not significant for all traits.

hormone secretion in the Pekin duck, which leads to achieve high weights, which that 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, 361/1184) 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 344/1081)) 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.

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.*,

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 consumption (g)	Dressing percentage with edible giblet
Muscat ducks	Males	344/1081	1.53±67.17Ba	1.55±72.81Ba
	Females	327/965	1.53±68.80Cb	1.55±74.63Bb
Average			1.08±67.99B	1.10±73.72AB
Pekin ducks	Males	227/1081	1.53±66.12Ca	1.55±71.12Ba
	Females	316/1081	1.53±69.55Bb	1.55±74.95Bb
Average			1.08±67.84B	1.10±73.04B
Local ducks	Males	339/1142	1.53±69.36Ab	1.55±74.87Ab
	Females	361/1184	1.53±72.82Aa	1.55±79.11Aa
Average			1.08±71.09A	1.10±76.99A

a, b, c, Small letters vertically indicating to significant $P>0.05$ differences between the average sex within breed for each traits; A, B: capital letters are vertically indicating that there are significant $p>0.05$ differences between the average of the breeds within the same gender; The interaction between strain and sex was not

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.

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).

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