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Effect of Generations and Feather Color Groups on Productive and Reproductive Performance of Female Quail

ABSTRACT

The research was carried out in the poultry unit fields / Nineveh Research Department, to identify the effect of four generations (1st , 2nd, 3rd and 4th) and feather color groups (black, brown, desert and white) of female quail on their productive performance. The results showed a significant improvement (P <0.05) through generations from 1st to 4th on egg production percentage and weight of eggs produced / kg, a significant increase (P <0.05) for feed consumption / kg as well as a significant decrease (P <0.05) for abnormal color percentage, while the four generations had no significant effect on Feed conversion ratio (feed kg / egg kg), age at 5% eggs production / day, hatchability percentage, fertility percentage, and sexual ratio. On the other hand, the desert color group feathers excelled significantly (P <0.05) in eggs weight / kg., Feed consumed / kg and the food conversion ratio / kg eggs compared to the black group only, and the lowest significant percentage (P <0.05) for colors anomalous was of the desert color group, there was no significant difference between the color groups of the rest of the other traits.

INTRODUCTION

The poultry industry is one of the important industries in the developed countries because it provides consumers with meat and eggs in addition to the economic return (Tarhel et al., 2012), Breeding species with a short generation period (4-5) weeks, such as quail, can be used for meat production, and egg production, as females mature at an early age of six weeks so that the peak of production usually reaches at the age of 8 weeks (Daida and Rani, 2017), the quail is an efficient food converter to produce one egg, which constitutes 8% of the body weight, while it is equivalent to 3% of the chicken's body weight, female quail lays approximately 250-300 eggs per year (Bagh et al., 2016), which provide the protein needed by people in developing countries (Dauda et al., 2014). Quail is used as a laboratory animal because of its small size, lack of large breeding space, short reproductive period (Rahman et al., 2016; Hussein and Hassan, 2017) as well as its resistance to common diseases in chickens (Al-Kafaji et al., 2018). Many researchers see an association between plumage color and quail egg productivity, fertility, hatchability, growth, mortality, and deformity (Minvielle, 2007; Kim et al. 2007; Thornberry, 2016 ; Rahman et al., 2016), Their opinions differed about the significance of the effects. It was found (Al-Tikriti and Al-Nadawi, 2006) a significant increase ($P \leq 0.05$) of black quail over brown quail in age at sexual maturity, the weight of the first egg, weight of eggs, number of eggs produced. (Islam et al. 2014) found a

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significant ($P \leq 0.05$) increase for the white color group over the rest color groups in the age at the first egg-laying, food conversion efficiency, fertility %, and hatching %, while they found increased Significantly ($P \leq 0.05$) for the black color group in the number of eggs produced. It was also reported (Bagh et al., 2016) that the brown color group reached a production of 50% significantly earlier ($P \leq 0.05$) by weeks than the white and gray groups. For (Al-Kafajy et al., 2018) found that the color of the feathers had a significant effect on body weight and egg characteristics, as it was shown that the white-colored birds gave a significantly higher number of eggs ($P \leq 0.05$) than the brown and black birds. On the other hand, (Hassan and Alsattar, 2016) did not find a significant effect of the color variation between the white and black groups on the trait of egg/female production, as confirmed by (Vali et al. 2006 and Al-Kafajy et al., 2018) there was no significant effect between quail colors on egg weight. The current research aims to identify the effect of successive generations, plumage color, and the interaction between them on the productive and reproductive efficiency of female quail.

METHOD AND MATERIALS

This study was conducted in the poultry fields of the Nineveh Research Department for the period 14/12/2018 to 22/12/2019 to identify the effect of generations and color groups feathers on the productive and reproductive performance of quail females. The birds were bred on the ground using the lighting program (16 hours of light: 8 hours of darkness), the birds were fed on a productive ratio containing 19% protein and 2857 metabolic energy, quail eggs were collected and stowed for 14 days from the generations in the station fields for each color feather separately to obtain the 2^{nd}, 3^{rd} and 4^{th} generation, average egg weight 11.50 $\pm$ 0.50 g and stored at 15 °C. The process of collecting eggs in the previous method was repeated after the arrival of the 4^{th} generation birds to produce eggs, after the completion of the collection process, the eggs were placed in the hatching room for heat homogeneity and then the eggs were placed in the incubator at a temperature of 36.6 °C and 60% relative humidity, on day 14 transferring the eggs from the incubator to the hatcher. After hatching, the chicks were divided according to their generation and color. The non-hatched eggs were broken to calculate the percentage of dead embryos, hatchability, fertility, and abnormal coloration. The sex ratio of hatched birds was also calculated. Chicks were weighed at hatching and then weekly. When the birds reached the age of sexual maturity, 16 females and 4 males/replicate /color were distributed within each generation by three replicates. The weight of feed intake and the remaining was weekly, later the eggs were collected for 8 weeks. The eggs produced were weighed daily for each color for each generation for each replicate separately, then the total weight was extracted at the end of the egg collection period, and the following was calculated from it:

egg production / female = No. of eggs produced / No. females x 100

Feed conversion efficiency (kg feed / kg eggs)= weight of feed consumed (kg) / weight of eggs (kg).

Statistical analysis: Complete random design (CRD) with two factors (generations × plumage color) was used to analyze the data. Duncan's multiple range test was also used to find out the significant effects of the two factors and their interaction on the studied traits (Al-Rawi and Khalaf Allah, 2000), the Chi-square test was used to analyze the data of the sex ratio by using the statistical program (SAS).

RESULTS AND DISCUSSION

Table (1) showed the results of some of the productive traits of quail for eight weeks of egg production, which were as follows:

Egg production %: The color group had no significant effect on this trait. The average percentages were (62.82, 68.26, 62.89, and 67.17)% for black, brown, desert, and white quail, respectively. These results agreed with (Hassan and Alsattar, 2016) and disagree (Al-Tikriti and Al-Nadawi, 2006). The reason for the difference in egg weight and the number of eggs produced/female may be attributed to the lack of functional similarity of the oviduct in female birds of different colors (Rahman et al., 2016). While a significantly increased ($P \leq 0.05$) were showed for generations

effect on egg production% which were (59.38, 66.68, 67.77, and 67.31)% for the 1st to 4th generations, respectively. This result agreed with (Hussain et al., 2016). The results of white quail for the 2nd, 3rd, and 4th generations were arithmetic higher than the rest of the color groups. The reason for the increase in egg production % may be due to (Hussain et al., 2016) which reported that the 1st generation did not express its production due to some uncontrolled factors that mainly depend on the genetic background, as well as to the response to the improvement in body weight, or perhaps the result of the large size of the ovary with an increase in albumin secretion (Hussain, 2013).

Egg weight (kg): The results showed that there was a significantly increased egg weight for the desert birds ($p \leq 0.05$) over the rest rest of the groups, as it gave the highest average egg weight of 8.57 kg during the experiment period, followed by the black and brown groups 7.49 kg and 7.96 kg, respectively, which did not differ significantly between them, but they were significantly superior to the white group 5.20 kg, The difference in egg weight and the number of eggs produced/female may be due to the lack of functional similarity of the oviduct in female birds of different colors (Rahman et al., 2016). It can be observed that there is a significant increase ($P \leq 0.05$) in the weight of eggs produced from the 1st to 4th generation (3.42, 7.15, 6.56 and 12.09) kg for the 1st, 2nd, 3rd, and 4th generations, respectively. These results are in agreement with (Gildersleeve et al.; 1987; Zita et al., 2013 and Hussain et al., 2016). The interaction between feather color and generations showed significantly increased for colors in the 4th generation, the desert feather had the highest significantly ($P \leq 0.05$) increased more than the rest in the same generation. The improvement in egg weight may be due to the bird's adaptation to the conditions field with the advancement of generations, or to the weight of the egg, or the increase in body weight (Al-Tikriti and Al-Nadawi, 2006 and Hussain et al., 2016). As well as the high weight of the egg may also be due to the high body weight (Al-Tikriti and Al-Nadawi, 2006 and Hussain et al., 2016).

Feed consumed (kg): The amount of consumed fodder differed significantly ($P \leq 0.05$) between the color groups, as the desert group, consumed the largest amount of feed 22.82 kg, followed by the black group 27.98 kg, then the brown group 25.68 kg, and finally the white group consumed the least amount of fodder with an average 17.62 kg, The difference in the feed consumed may be due to the genetic variation between the feather color groups (Hussain et al., 2016). Feed consumption also increased significantly ($P \leq 0.05$) from the 1st to 4th generation 11.03, 24.58, 22.56, and 42.25 kg, respectively. This result agreed with (Hussain et al., 2016). Also, all colors were increased significantly ($P \leq 0.05$) in the 4th generation comparing the rest of the generations. The increase in feed consumption may be due to an increase in body weight (Hussain, 2013) or an increase in egg production. The effect of the interaction between color groups and generations, a significantly increased ($P \leq 0.05$) appear in feed consumption for of all colors groups in the 4th generation, the amount of feed consumed in the 4th generation reached 44.60, 32.10 , 61.00, 3130) for black, brown, desert and white birds, respectively.

Food Conversion Ratio (kg of feed / kg of eggs): The black group's FCR was significantly ($P \leq 0.05$) higher than the rest groups, which did not differ significantly, the averages of black, brown, desert and white feather groups were 3.69, 3.22, 3.39 and 3.38 kg feed / kg eggs weight, these results agreed with (Jassim et al., 2006; Hassan and Abdel Sattar, 2015 and Rahman et al., 2016) in the black group superiority in the FCR over the rest of the colors in their study. While the generations had no significant effect on this trait, but there was an increase FCR for generations from 1st to 4th, 3.28, 3.41, 3.45 and 3.54, respectively, this agreed (Khaldari et al., 2010). The interaction between generations and feather color groups did not have a significant effect except in the case of the brown color in the 2nd generation only. These may be due to the amount of feed intake compared to the weight of the eggs produced (Rahman et al., 2016) and the weight of the eggs. (Hussain, 2013).

Table (2) shows the effect of generation and feather color on egg characteristics of quail birds, as follows:

Table (1): Effect of Generation and Feather Color group on reproductive performance in quail (mean ± sd)

		1st		2nd		3rd		4th		Feather mean	
egg production	Black	52.63±1.73	C	66.10 ± 2.22	AB	67.85 ± 8.64	AB	64.71 ± 5.79	AC	62.82 ±7.76	A
	Brown	67.84 ±3.5	AB	67.99 ±4.58	AB	68.39 ± 6.45	AB	68.80 ± 10.34	AB	68.26 ± 5.77	A
	Desert	59.58 ± 8.96	AC	63.30 ± 5.49	AC	64.00 ± 3.12	AC	64.70 ± 1.06	AC	62.89 ± 5.13	A
	White	57.47 ± 2.90	BC	69.33 ± 11.73	A	70.83 ± 7.75	A	71.03 ± 6.55	A	67.17 ± 8.94	A
Generations mean		59.38 ± 7.20	B	66.68 ± 6.38	A	67.77 ± 6.35	A	67.31 ± 6.45	A		
egg weight / kg	Black	4.41 ± 0.10	HG	7.13 ± 0.026	F	6.99 ± 0.29	F	11.44 ± 0.11	B	7.49 ± 2.64	B
	Brown	3.75 ± 0.01	HG	7.95 ± 0.09	EF	10.44 ± 0.12	BC	9.71 ± 0.05	CD	7.96 ± 2.71	B
	Desert	2.21 ± 0.01	I	8.98 ± 0.06	DE	4.25 ± 0.61	HG	18.84 ± 1.6	A	8.57 ± 6.74	A
	White	3.33 ± 1.84	H	4.53 ± 0.08	HG	4.56 ± 0.28	G	8.36 ± 0.08	E	5.20 ± 2.13	C
Generations mean		3.42 ± 1.14	D	7.15 ± 1.77	B	6.56 ± 2.60	C	12.09 ± 4.28	A		
feed consumed/kg	Black	15.82 ± 0.00	I	24.99 ± 0.01	G	25.49 ± 0.00	F	44.60 ± 0.00	B	27.98 ± 10.89	B
	Brown	12.28 ± 0.01	L	24.11 ± 0.01	H	34.24 ± 0.02	C	32.10 ± 0.02	D	25.68 ± 8.99	C
	Desert	6.82 ± 0.00	N	8.98 ± 0.06	C	14.49 ± 0.01	K	61.00 ± 0.10	A	29.14 ± 21.86	A
	White	9.20 ± 0.87	M	15.00 ± 0.00	J	14.99 ± 0.08	J	31.30 ± 0.04	E	17.62 ± 8.62	D
Generations mean		11.03 ± 3.54	D	24.58 ± 7.11	B	22.56 ± 8.64	C	42.25 ± 12.57	A		
FCR kg feed / kg of eggs	Black	3.58 ± 0.08	AC	3.50 ± 0.01	AC	3.79 ± 0.15	AB	3.89 ± 0.3	A	3.69 ± 0.18	A
	Brown	3.27 ± 0.01	AC	3.02 ± 0.03	C	3.20 ± 0.03	AC	3.30 ± 0.01	AC	3.22 ± 0.11	B
	Desert	3.00 ± 0.01	C	3.81 ± 0.02	AB	3.44 ± 0.45	AC	3.25 ± 0.28	AC	3.39 ± 0.36	B
	White	3.18 ± 1.16	BC	3.30 ± 0.06	AC	3.29 ± 0.19	AC	3.74 ± 0.03	AB	3.38 ± 0.38	B
Generations mean		3.28 ± 0.53	A	3.41 ± 0.29	A	3.45 ± 0.31	A	3.54 ± 0.34	A		

The different letters on the means within each trait refer to significant ($p < 0.05$) differences between those means, according to Duncan's test and vice versa.

Table (2): The effect of generation and color groups on some egg traits in quail birds (mean + sd)

		1st		2nd		3rd		4th		Feather mean	
Age at 5% eggs produce	Black	39.00 ± 0.00	A	39.00 ± 0.00	A	39.00 ± 0.00	A	39.00 ± 0.00	A	39.00 ± 0.00	A
	Brown	41.00 ± 0.00	A	40.00 ± 0.00	A	42.00 ± 0.00	A	42.00 ± 0.00	A	41.25 ± 0.82	A
	Desert	41.00 ± 0.00	A	40.00 ± 0.00	A	42.00 ± 0.00	A	40.00 ± 0.00	A	40.75 ± 0.82	A
	White	40.00 ± 0.00	A	40.00 ± 0.00	A	42.00 ± 0.00	A	40.00 ± 0.00	A	40.50 ± 0.86	A
Generations mean		40.25 ± 0.82	A	39.75 ± 0.43	A	41.25 ± 1.29	A	40.25 ± 1.08	A		
Hatching percentage	Black	50.31 ± 1.45	F	81.81 ± 8.50	AC	73.90 ± 16.04	BD	68.01 ± 8.35	DE	68.51 ± 14.81	A
	Brown	53.24 ± 1.47	F	71.40 ± 1.56	BE	94.62 ±7.72	A	66.55 ± 6.55	DE	71.45 ± 16.21	A
	Desert	49.50 ± 8.76	BD	52.97 ± 2.80	F	75.53 ± 7.70	BC	89.58 ± 11.61	A	66.39 ± 18.38	A
	White	50.33 ± 2.51	F	70. 19 ± 2.71	CE	59.09 ± 5.31	EF	84.52 ± 1.73	AB	66.05 ± 13.69	A
Generations mean		50. 84 ± 4.25	C	69.09 ± 11.53	B	75.28 ± 15.76	A	77.19 ± 12.50	A		
Fertility percentage	Black	92.95 ± 1.10	AB	96.42 ± 1.09	AB	92.13 ± 0.81	AB	91.23 ± 1.63	AB	93.18 ± 2.29	A
	Brown	58.64 ± 5.16	C	93.70 ± 2.64	AB	98.08 ± 2.11	A	99.88 ± 9.53	A	87.57 ± 18.26	A
	Desert	82.66 ± 2.40	B	97.93 ± 8.28	A	86.68 ± 0.97	AB	92.85 ± 23.21	AB	90.03 ± 12.19	A
	White	87.13 ± 8.45	AB	90.35 ± 0.69	AB	95.97 ± 5.24	AB	93.45 ± 4.20	AB	91.72 ± 5.76	A
Generations mean		80.34 ± 14.31	B	94.60 ± 4.81	A	93.21 ± 5.15	A	94.35 ± 11.40	A		
Abnormal colors	Black	11.76 ± 1.10	BC	3.16 ± 1.21	DE	5.49 ± 0.66	DE	4.41 ± 0.61	DE	6.20 ± 3.55	AB
	Brown	13.34 ± 1.19	B	5.19 ± 1.41	DE	5.59 ± 0.90	DE	3.36 ± 0.66	E	6.87 ± 4.10	A
	Desert	9.47 ± 2.06	C	5.60 ± 1.02	D	3.31 ± 1.45	DE	2.00 ± 0.73	DE	5.09 ± 3.17	B
	White	17.07 ± 6.02	A	3.60 ± 0.67	DE	3.69 ± 0.83	DE	3.96 ± 0.85	DE	7.08 ± 6.57	A
Generations mean		12.91 ± 4.02	A	4.39 ± 1.43	B	4.52 ± 1.32	B	3.43 ± 1.13	B		

The different letters on the means within each trait refer to significant ($p < 0.05$) differences between those means, according to Duncan's test and vice versa.

Hatching%: There were no significant differences between color groups in hatching percentage of 68.51%, 71.45%, 66.39% and 66.60% for black, brown, desert and white groups, respectively, While a significant increase ($p \leq 0.05$) of generations was observed, as the 3rd and 4th generations were significantly increased to the 1st and 2nd generations, the 2nd generation significantly increased to the 1st generation, the mean of hatching% for the 1st, 2nd, 3rd, and 4th generations were 50.84%, 69.09%, 75.28, and 77.19% respectively. These results are in agreement with (Gildersleeve et al., 1987). Randomly significant differences ($p \leq 0.05$) also appeared in the interaction between color groups and the generations, represented by the significant increase ($p \leq 0.05$) for the brown – 3rd generation (94.62%) and (8958%) for desert – 4th generation, these results did not agree with (Islam et al. 2014).

Age at 5% eggs production (day): There were no significant differences Between feather color groups, generation and their interaction effect on this trait, although it was noted that the black group had earlier days to laying (39 days) than the rest groups. This result agreed with (Al-Tikriti and Al-Nadawi, 2006; Gildersleeve et al., 1987 and Bulus et al., 2013) refer to the age of quail birds at first egg laying is at 5-6 weeks of age, the difference in the number of days needed to lay eggs may be due to genetic makeup and condition. The physicality of birds (Hussain et al., 2016).

Fertility %: The feather color black, brown, desert, and white, had no significant effect on fertility 93.18%, 87.57%, 90.03%, and 91.72% respectively. The s2nd, 3rd, and 4th generations also increased significantly ($p \leq 0.05$) over the 1st generation 80.34%, 94.60%, 93.21%, and 94.35%, respectively, these results agreed with (Gildersleeve and, 1987). The best significant effect of the interactions ($P \leq 0.05$) was the 4th generation by brown feathers (99.88%), which was significantly superior to the 1st generation - brown and desert feathers (58.64% and 82.62%), respectively.

Abnormal colors: There were significant ($P \leq 0.05$) differences between the feather groups for abnormal colors, where the highest abnormal colors percentage appeared in the white feather 7.08% and the lowest in the desert feather 5.09%, the mean of this trait decreased significantly ($P \leq 0.05$) with the progression of the generations, 12.91% to 3.43%, as well as the interaction between the color of feathers and the generations, as it appears in general for the data of the abnormal colors% decreased with the progression of the generation that decrease is due to the processes of excluding birds with a color that does not match the color group in each generation.

Table (3) shows that there is no significant effect of generations on the sex ratio between males and females for all color groups. It is noted that there is a mathematical improvement resulting from the increase in the number of eggs produced, which leads to a higher percentage.

Table (3): The generations effect on sex ratio in the quail feather color.

	Feather color							
Generation	Black		Brown		Desert		White	
	female	male	female	male	female	male	female	male
1st	4	5.71	5.52	8.62	7.17	14.35	2.99	2.99
2nd	11.43	8.57	8.62	6.55	10.76	7.62	18.41	13.43
3rd	10.29	10.86	9.66	5.86	7.62	5.83	14.93	17.91
4th	26.86	22.29	29.66	25.52	25.56	21.08	15.92	13.43
X^2	1.55^{NS}		5.02^{NS}		5.31^{NS}		2.13^{NS}	

NS refer to not significant according to the chi-square test.

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تأثير الأجيال والوان الريش على الاداء الإنتاجي والتناسلي لاناث طائر السمان

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الكلمات المفتاحية:
تأثير الأجيال، والوان الريش، طائر السمان تربية وتحسين

الخلاصة

تم تنفيذ البحث في وحدة الدواجن قسم بحوث نينوى للتعرف على تأثير أربعة أجيال (الأول ، الثاني ، الثالث والرابع) ومجاميع لون الريش (الأسود والبني والصحراوي والأبيض) لطيور السمان في أدائها الإنتاجي والتناسلي. أظهرت النتائج تحسن معنوي ($P < 0.05$) خلال الأجيال من الأول الى الرابع في انتاج البيض% ووزن البيض المنتج / كغم وزيادة معنوية ($P < 0.05$) للعلف المستهلك / كغم كذلك انخفاض معنوي ($P < 0.05$) للألوان الشاذة%، في حين لم يكن للأجيال الأربعة تأثير معنوي في كفاءة التحويل الغذائي كغم علف / كغم بيض والعمر عند انتاج 5% بيض/يوم والفقس% والخصوبة% و النسبة الجنسية. من جهة أخرى تفوقت مجموعة لون الريش الصحراوي معنوياً ($P < 0.05$) في وزن البيض المنتج / كغم والعلف المستهلك / كغم وكفاءة والتحويل الغذائي كغم علف / كغم بيض مقارنة بمجوعة اللون الأسود فقط، كما ان اقل نسبة معنوية ($P < 0.05$) للألوان شاذة كانت لمجموعة اللون الصحراوي، ولم يكن هناك فرق معنوي بين المجاميع اللونية لبقية الصفات الأخرى