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Comparison of the production performance of some phenotypic groups and their crosses of quail birds

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Abstract: The study aimed to determine the production efficiency of local quail phenotypic groups with different feather colors (white, brown, and desert) and their crosses. The results showed significant differences between groups in average body weight at 2, 4, and 6 weeks of age, and in weight gain at 2 and 4 weeks of age in favor of the T6 cross followed by the T5 cross, while T1 recorded the lowest body weight and weight gain compared to other hybrids. Significant differences in feed consumption were observed at 2 and 6 weeks, with no significant differences at 4 weeks. The highest feed consumption was recorded at 6 weeks for hybrids compared to pure groups, and feed conversion efficiency improved at 2 weeks for T5 and T6. At 4 weeks of age, T5, T7, and T6 recorded the best feed conversion efficiency. Positive heterosis in weight at 4 weeks was observed in favor of T5, T6, and T7, while it was negative in T4. Body weight at 6 weeks increased in hybrids T5, T6, and T7 compared to their expected value in the parental groups, and feed conversion efficiency improved at 6 weeks in hybrids T4 and T7. We conclude that heterosis increases the economic value of hybrids, with T6 and T5 being the best hybrids.

Keywords: Quail, Crosses, Production Characteristics, Heterosis

مقارنة الأداء الإنتاجي لبعض المجاميع المظهرية من طائر السمان وتضريباتها

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كلية الزراعة والغابات | جامعة الموصل | العراق

المستخلص: هدفت الدراسة إلى معرفة الكفاءة الإنتاجية لمجاميع مظهرية من طائر السمان المحلي بألوان ريش مختلفة (أبيض، بني، وصحراوي) وتضريباتها. أظهرت النتائج وجود فروقات معنوية بين المجاميع في متوسط وزن الجسم عند عمر 2، 4، و6 أسابيع، وكذلك في الزيادة الوزنية عند عمر 2 و4 أسابيع لصالح التضريب T6 يليه التضريبT5 ، بينما سجل T1 أقل وزن جسم وأقل زيادة وزنية مقارنة بباقي الهجن. كما كانت هناك فروقات معنوية في استهلاك العلف بين المجاميع عند الأسابيع 2 و6، بينما لم يُلاحظ أي فروق معنوية عند الأسبوع 4. تحسنت كفاءة التحويل الغذائي عند عمر أسبوعين لصالح T5 و .T6عند عمر 4 أسابيع، سجلت المجاميعT5 ، T7، و T6 أفضل كفاءة تحويل غذائي. كما تم تسجيل قوة هجينة إيجابية في الوزن عند عمر 4 أسابيع لصالحT5 ، T6، وT7، بينما كانت سلبية في التضريب .T4 ازداد وزن الجسم عند عمر 6 أسابيع في الهجن الناتجة من التضريبT5 ، T6، و T7 مقارنة مع القيم المتوقعة في المجاميع الأصلية، وتحسنت كفاءة التحويل الغذائي عند عمر 6 أسابيع في الهجن T4 و .T7 نستنتج أن التهجين يزيد من القيمة الاقتصادية للهجن، حيث كان T6 و T5 أفضل الهجن.

الكلمات المفتاحية: طائر السمان، تضريب، صفات إنتاجية. قوة هجين

Introduction:

Quail is an economic alternative to chicken (as a protein source) and is one of the smallest types of birds that have been raised to produce meat and eggs, and these birds have economic importance as a commercial species that provides meat of high economic value and has a unique special flavor (Al-Dabbagh and Tawfiq, 2023). As a result of the continuous population increase and to cover the food shortage, most countries tended to find new ways to increase production, so studies, research and increased interest began at the beginning of the twenty-first century to participate in chicken projects to produce meat and eggs with different types of domestic birds to varying degrees, including quail, characterized by its small size that requires small areas, as well as the short generation period (3-4) generations per year, early puberty, resistance to diseases and high egg production (Jatoi et al., 2013) and (Rabie, 2019). Modern breeding works to create high performance lines that are of major importance to breeders (Kulibaba and Podstreshnyi, 2012), so hybridization is one of the important methods used in breeding and improvement programs that work to raise the productive value and transfer and collect a large number of desirable genes in the resulting hybrids (Hanafi and Iraqi, 2001). The quails that result from hybridization are better in various economic traits such as growth rate, feed efficiency, age at first egg, egg and meat production characteristics, and others, as mentioned (Tawfeq and Hadi, 2021) that hybridization between different types of quail led to improved carcass traits and body weight. Therefore, this study aimed to compare different phenotypic groups of quail and their effects on production performance.

Materials and Methods:

The research was conducted in the poultry fields of the Department of Agricultural Research / Nineveh Research Department for the period from 25/9/2018 to 9/3/2019 and the production performance was compared between the groups of brown, desert and white and their crosses. 96 quails (sires and dams) were divided into three different groups by feather color (T1white, T2 brown and T3 desert), each group included four replicates (2 males and 6 females) and were reared in cages with dimensions of 40 × 40 × 40 × 40 40cm as the eggs were hatched after collection to obtain the offspring from each group and were divided into four groups, namely T4(♂ white × ♀ brown), T5(♂ brown × ♀ white),T6 (♂ white × ♀ desert) and T7 (♂ desert × ♀ white). Eggs from these groups were collected and hatched to obtain the offspring resulting from crossing and breeding these groups and were compared in terms of production traits such as live body weight, feed consumption, weight gain and feed conversion efficiency. The birds were fed a standardized broodstock (starter and finisher) whose ingredients were calculated according to (N. R. C., 1994). The protein content of the starter feed was 22.23% and the energy content was 22958.90 (kcal/kg feed), while the finisher feed had a protein content of 19.62% and energy content of 3030.10 (kcal/kg feed). Feed and water were offered freely and birds were weighed at one day, 2, 4 and 6 weeks of age and production traits (initial weight, live body weight for the rest of the weeks, weight gain, feed consumption and feed conversion efficiency) were recorded.

Statistical Analysis

A completely randomized design (CRD) was used to analyze the results and the mathematical model equation was $Yij = \mu + Gi + eij$

Where:

Yij = the value of the jth observation due to the genotype

μ = the overall mean of the traits under study

Gi = the genotype

eij = the random error that follows the normal and independent distribution with mean = zero and variance = 1 , and Duncan's test was used to compare the means of all studied traits (SAS Statistical Software, 2012).

Results and discussion:

The results shown in chart 1 indicated that there were significant differences between quail, crosses and reciprocal crosses in the mean body weight at 2, 4 and 6 weeks in favor of the cross (♀ white x ♂ desert), followed by the cross (♀ brown x ♂ white), desert quail, crosses (♀ white x ♂ brown) and (♀ desert x ♂ white) and then brown quail, while white quail recorded the lowest body weight and the weights at 2 weeks of age were (88.33, 86.80, 86.27, 73.90, 72.90, 77.10 and 68.00) gm respectively, at 4 weeks the live body weight was (182.33, 175.0, 163.0, 154.67, 154.67, 154.67, 153.67, 143.0) gm respectively, and at the age of 6 weeks, body weight

(289.43, 284.47, 277.30, 277.0, 271.57, 255.33, 254.67) gm for both crosses (white × desert) followed by crosses (× structure) then desert quail and reciprocal crosses (white × structure) , brown , white and less weight For (white × desert) respectively. This superiority may be attributed to the difference in genetic stock between different groups of quail and to the investment of non-aggregate genetic variation responsible for hybrid potency (Falconer, 1981). These results are consistent with Tawfeeq and Hadi (2021), who reported an improvement in body weight at 6 weeks of age between different quail hybrids and compared with their parents (Tawfeq et al., 2020). (Hassan and Abdul Sattar ,2017) reported a study of three line of quail (black, white and brown) that exceeded brown and black on white in body weight at the fourth week. No significant differences in primary body weight were observed between the studied groups. Contrary to what he found (AL-Barzinji and hamed, 2022), they did not notice any moral differences in the living body weight of white, brown and desert quail at the age of 4 weeks.

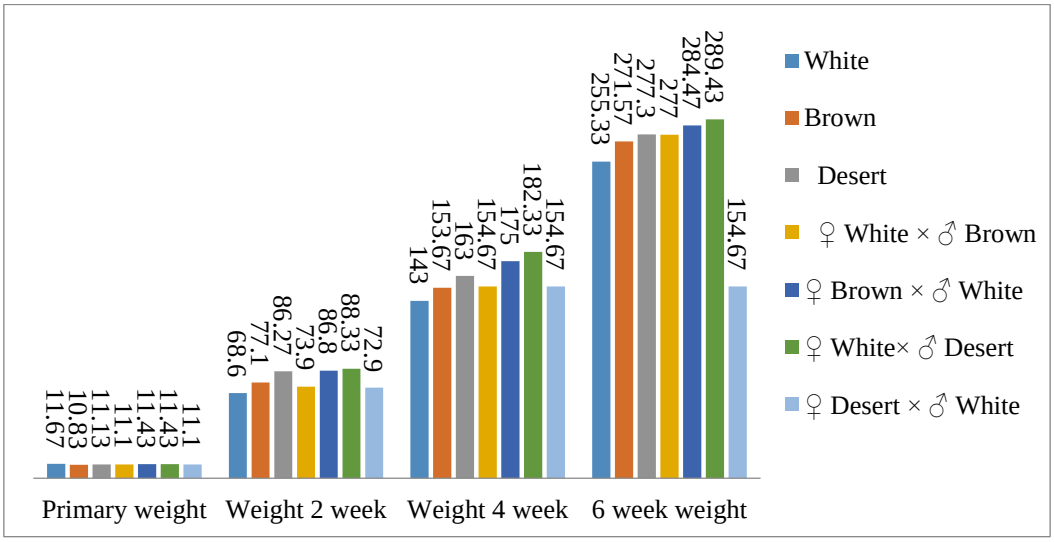

Chart 1 Weekly live body weight

Chart 2 also shows that there are significant differences between quail totals and crosses in the weight gain at 2 and 4 weeks of age in favor of the cross (♀ white x ♂ desert), followed by the cross (♀ brown x ♂ white), then brown, desert and cross (♀ white x ♂ brown) and (♀ desert x ♂ white) while the white quail recorded the least weight gain, the average weight gain at 2 weeks of age was (77.20, 75.37, 75.13, 66.13, 66.80, 62.80, 61.80 and 56.93) g respectively, and at 4 weeks of age (94.00, 88.20, 81.77, 80.77, 76.73, 76.57, 74.40) g each for crossbreeding (♀ white × ♂ desert), (♀ brown × ♂ white), (♀ desert × ♂ white), crossbreeding (♀ white × ♂ brown), desert quail, brown quail, and white quail) respectively. At 6 weeks of age, there were no significant differences between the groups. The reason for this increase may be attributed to the exploitation of noncombinatorial genetic variation responsible for hybrid vigor as these results were similar to those found by (Hassan and Abdul Sattar 2017), (Al-Muaini 2007), and (Tawfiq et al. 2020).

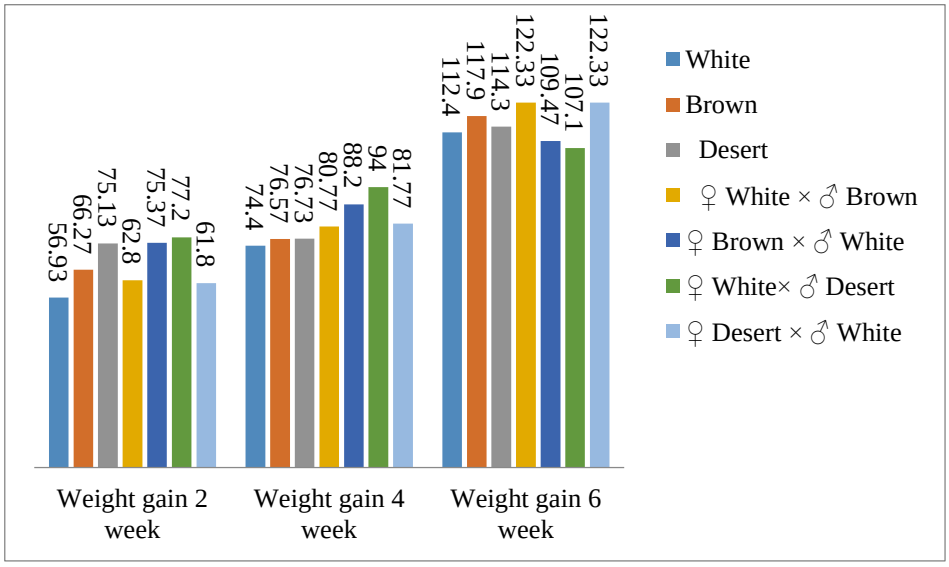

Chart 2 Weekly Weight Gain Rate

It was observed from Chart 3 for feed consumption that there were significant differences between the studied groups at week 2 and week 6, while no significant differences were observed at week 4, as the highest feed consumption was recorded at week 6 for purebreds, amounting to (263.80, 258.93, 264.07, 263.80) g for the battered groups, while the purebred white, brown and desert groups consumed less feed (211.33, 221.10, 231.80) gm, respectively. These results were contrary to what was found by (Tawfeq et al., 2020) and Al-Nuaimi et al. (2014). Desert quail consumed the highest amount of feed than the other groups at the age of two weeks, and this result was close to what was found by (Tawfeq et al., 2020), (Al-Nuaimi et al. 2014) and (Jassim 2011).

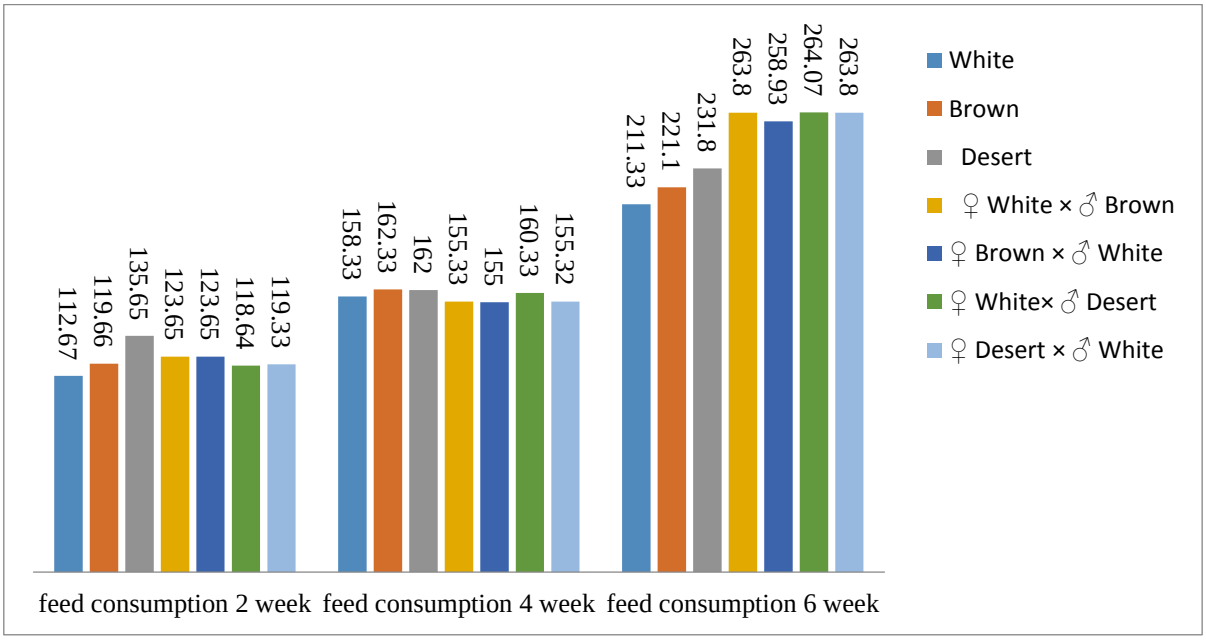

Chart 3 Weekly feed consumption

As for feed conversion efficiency, the crossed groups recorded the best feed conversion efficiency at two weeks of age, chart 4, for (♀ brown x ♂ white) and ♀ white x ♂ desert, as it reached (1.53, 1.57) gm feed/gm weight gain over the rest of the groups. At the age of four weeks, the cross groups (♀ brown × ♂ white), (♀ desert × ♂ white) and (♀ white × ♂ desert) recorded the best feed conversion efficiency compared to the rest of the groups, reaching (1.80, 1.90, 1.70) gm feed/gm. An increase in weight over the rest of the groups.. This result is similar to what was found by (Tawfeq et al., 2020), (Al-Naimi et al. 2014), and (Jassim, 2011). While white, brown, and desert quail had the best feed conversion efficiency over the rest of the groups.

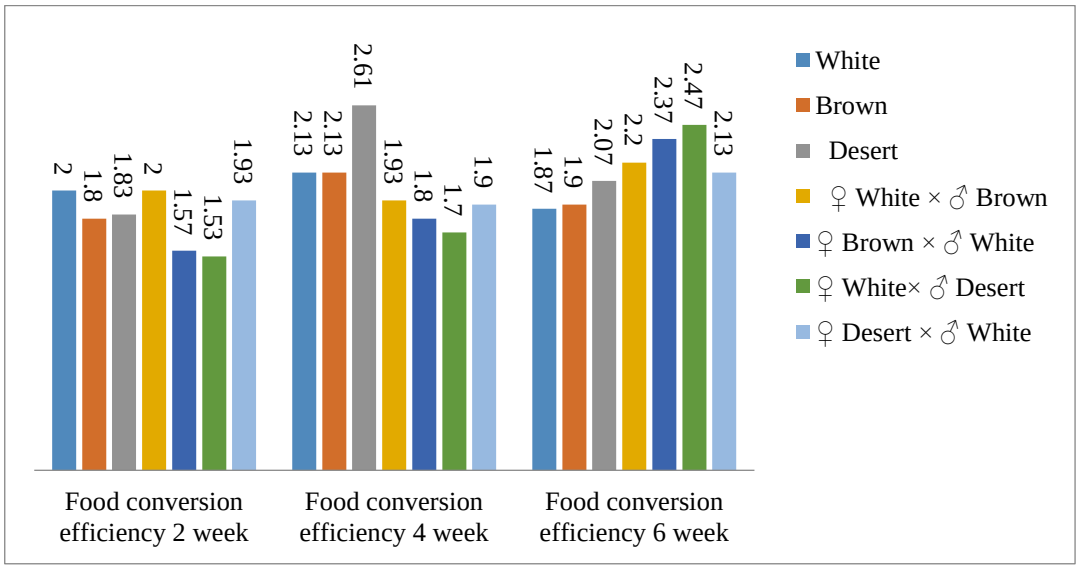

Chart 4 Weekly food conversion efficiency

Heterosis:

Table (1) shows the hybrid vigor resulting from cross-breeding between white, brown and desert quail in some characteristics of quail during the 6-week breeding period. It was noted that the strength of the hybrid was positive at four weeks in favor of the hybrid (♀ brown x ♂ white) followed by (♀ white x ♂ desert) and (♀ Desert x ♂ white), reaching (19.20, 10.50, 1.13) gm respectively compared to the average of its parents, while the heterosis was negative in the hybrid (♀ white x ♂ brown) of (-2.30) g. This may be due to the maternal effect of brown and white quail. As for body weight at 6 weeks, the value increased in the hybrids resulting from the tax (♀ brown x ♂ white) followed by (♀ white x ♂ desert) and (♀ desert x ♂ white) in balance with its expected value in the main (parents). Thus, the strength of the hybrid appeared negative at the age of 4 weeks in the above hybrids indicating an improvement in the food conversion factor after the procedure. At the age of 6 weeks, the conversion efficiency of the hybrid improved (♀ white x ♂ brown) and (♀ Desert x ♂ white), while there were no significant differences in the rate of weight gain between hybrids. These results are similar to what they found (Hassan and Hussain,2017) when studying the effect of crossbreeding For three types of Japanese quail (white, black and brown), they noticed that white breeding with brown and brown with white gave the highest hybrid to productivity characteristics such as body weight, feed consumption and the least efficient food conversion. Contrary to what he found (Hussen and Salih, 2018). Contrary to what they found (Al-Barzinji and Hamed, 2022), they found that there is a moral superiority between males and white females at the age of 4 weeks for a living body weight.

Table 1 The effect of hybrid vigor on the productive characteristics of quail hybrids

Hybrid / Trait	♀Desert×♂White	♀White×♂Desert	♀Brown×♂White	♀White×♂Brown
Body weight at 4 weeks	1.13±1.97 c	10.50±3.95 b	19.20±1.82 a	-2.30±1.82 c
Body weight at 6 weeks	4.0±2.11 ab	3.70±1.99ab	8.70±0.76a	9.93±0.92 b
Weight gain at 4 weeks	7.27±4.30	15.27±8.33	25.0±6.25	7.33±6.01
Weight gain at 6 weeks	7.70±3.52	-5.43±7.45	-5.43±1.21	5.43±1.47
Conversion efficiency 4 weeks	-9.80±2.86	-15.90±5.92	-20.73±2.86	-10.97±5.30
6 weeks conversion efficiency	11.60±3.70 ab	19.57±5.69 ab	25.17±4.47 a	7.83±4.04 b

Mean with different letter in a horizontally with different significantly ($p < 0.05$). Heterosis was calculated using the following equation: Heterosis = (Average expected hybrid performance - Average actual hybrid performance) / (Average expected hybrid performance) × 100. and using the SAS statistical, 2012 program the results were analyzed.

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