Effects of Breed on hatchability and immune characteristics of indigenous chickens

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Abstract

This study, was conducted at Hemn Private Hatchery in Erbil, Kurdistan Region, Iraq, examined 600 eggs (average weight 52.75±0.13 g) from 50-week-old indigenous chickens under sterile conditions. Findings revealed that Kurdish local chickens had a higher egg weight (55.60 g) compared to Iraqi black line (49.83 g). On the 18th day of incubation, average egg weights were 48.20 g for Kurdish chickens and 42.13 g for Iraqi black line, while by day 21, the weights dropped to 35.12 g and 31.93 g, respectively. Egg loss was 7.70% in Kurdish chickens and 7.40% in Iraqi black line. During the season, egg weight decreased by 17.90% in Kurdish chickens and 20.48% in improved chickens. Hatchability rates of total eggs were 67.27% for Kurdish chickens and 69.69% for Iraqi black line, while hatchability of fertile eggs was 75.05% and 76.71%, respectively. Embryo mortality was 33.33% in Iraqi black line and 30.40% in Kurdish breed. Additionally, Improved chickens showed greater resistance to Newcastle and Gumboro diseases than local Kurdish chickens.

Keywords: Hatchability, Immunity, Traits, Iraqi local chicks.

Introduction

One of the most common poultry species is the chicken (*Gallus gallus*), which contributes significantly to the animal protein in human diet [1]. From the wild form, it has developed into the original village chickens [2] as well as contemporary multi-layer broilers, game, breeds. Local chickens in various Iraqi locations are a diverse population with varying physical and quantitative traits [3]. They are distinguished by their small body size, and comparatively high product pricing when compared to commercial poultry [4]. Additionally, their genetic makeup gives them a strong resistance to Additionally, they are very resistant to endemic illnesses and extreme climatic circumstances due to their genetic origin [5]. The local chicken population plays a main role in the national and public economy, despite low efficiency and scavenging practices

[6]. Furthermore, poultry farming has the potential to provide additional income and improve nutritional security for vulnerable populations [7]. These breeds should be integrated into significant alternative projects [8]. Additionally, [9] found that El-Salam and Mandarah chicks perform better in terms of maturity and hatchability compared to other strains (Canadian shaver A, B, and C). Similarly, [10] observed improvements in hatchability, and chick weights in local varieties due to breed-associated characteristics.

The Silver Montazah strain demonstrated superior productivity, hatchability, and chick loads compared to the Matrouh strain, while local strains showed better hatchability rates. Assessing egg quality is crucial for productivity, chicken care, business success, and embryonic development. Local chickens exhibit consistent performance under organized systems. Chick quality at hatch was evaluated by [11].

This study aimed to the hatching and immune features of indigenous chickens of Iraqi breeds (Kurdish and Black line), therefore adding to the knowledge of the possible advantages of enhanced and unique chicken types on egg quality and hatching success.

Materials and Methods

Experimental Design

This study conducted in Hemn private incubation center in Erbil Governorate/Kurdistan, Iraq during the period from December 10, 2023 to February 28, 2024. A sum of 600 fertile eggs with a mean of 52.75±0.13 g at 50-weeks old of two genotypes of chickens included Iraqi black line, which obtained from Baghdad Research Centre and Kurdish local chickens which collected from different villages around Erbil city. The eggs were collect in sterile circumstances then randomly scattered between two Collectives before hatching, and cleaned at the first day, experimental design was (G1) Iraqi black line (Improved chickens) and (G2) Kurdish local chickens, each genotypes had five replications.

The measured traits include:

1.Hatchability of total eggs% = No. of hatched chicks/ No. of total eggs X 100 [11].

2.Hatchability of total fertile eggs% = No. of hatched chicks / No. of fertile eggs X 100 [11].

3. After hatching, all eggs remained after hatching were broken to measure the embryonic dead as a proportion of egg sets.

4. Chick quality at hatch was measured according to [11] as in Table (1)

Table (1): chick quality measurement according to the system.

Scores	Characteristics	Parameters
Activity	Good	6
	Weak	0
Down and appearance	Clean and dry	00
	Wet	8
	Dirty and wet	0

Retracted yolk	Normal	01
	The yolk is large in size and of hard characters with tautch	0
Eyes	Open and bright	06
	Open, not bright	8
	Closed	0
Legs	Normal legs and toes	06
	One infected leg	8
	Two infected legs	0
Navel	Completely closed and clean	01
	Not closed and not discolored	6
	Not closed and discolored	0
Remaining membrane	No membrane	01
	Small membrane	8
	Large membrane	4
	Very large membrane	0
Remaining yolk	No yolk	06
	Small yolk	01
	Large yolk	8
	Very large yolk	0

Incubation and Hatching

The eggs were put in a hatchery machine with the temperature37.5°C and relative moisture 55%, Each egg had a number. and measured On the 18th day of brooding, the eggs were transferred to hatchers for the incubation phase. Following that, they finished the last three days of brooding in a hatcher at 37.2 °C and 65% relative moisture until hatching.

Statistical Analysis

Data was analyzed by using the t-test model by [12] programming and compare means by [13] at significantly ($P \leq 0.05$).

Results and Discussion

Table (2) shows of the effect of different breeds on egg weight at various stages of production. A higher egg weigh of Kurdish chicken (55.60 was better than Iraqi black line (49.83 gm). Furthermore, at 18th day similarly the close by chicken egg came to 48.20 gm and in better area breeds was 42.13 gm and at 21st day of creation the ordinary egg weight in Iraqi black line was 35.12 gm and in prevalent close by chickens was 31.93 gm.[14,15] affirmed these discoveries. when found comparable different genetic lines basically affected egg weight and egg production. Same results between strains, lines, and breeds in terms of egg production were found ([16,17,18,19], also documented differences in egg production between genotypes [20,21].

Even though local hens' muscles deteriorate over time, their increased weight may benefit egg size and nutritional content because heavier eggs typically contain more resources

for embryo development, which may affect hatchability and chick viability. As a result, breeding programs aimed at improving hatchability and egg weight may benefit from these findings.

Table (2): Breeds' effects on egg weight at various period of production (M±SE).

Genotypes	Egg weight (g)		
	Zero day	18th Day	21st Day
Improved local	49.83 ±.0.99 B	42.13 ±1.64 B	31.93 ±0.18 B
Local chickens	55.60 ±1.06 A	48.20 ±0.70 A	35.12 ±1.04 A
P.value	0.017	0.027	0.040

Means within the same column of different litters are significantly different at (P ≤ 0.05)

Hatchability is a complicated quantitative trait which is determined by incubation conditions, dietary factors, and hereditary characteristics. The majority of undeveloped Rather than low-quality eggs and an unbalanced diet, poor brooding conditions are linked to hatching-period mortality.

The results presented in Table (3) showed that, there was no-colossal (P > 0.05). The observed decrease in egg weight in improved local hens during the 0–18 and 0–21day incubation periods indicates that similar biological and environmental variables may be at play. Common influences include temperature, humidity, egg size, and shell porosity. Differences in water loss are minimized since both groups have comparable genetic features and eggshell properties. The observed decrease in egg weight in improved local hens during the 0–18 and 0–21day incubation periods indicates that similar biological and environmental variables may be at play. Common influences include temperature, humidity, egg size, and shell porosity. Differences in water loss are minimized since both groups have comparable genetic features and eggshell properties [4].

Table (3): The percentage % of eggs weight lost during incubation period between local and Iraqi black lines(M±SE).

Genotypes	Egg weight loss (%)	
	0-18th day	0-21st day
Improved local	7.70 ±2.1 A	17.90 ±1.15 A
Local chickens	7.40 ±0.80 A	20.48 ±2.1 A

P.value	0.90	0.34

Means within the same column of similar litters are not significantly different at (P > 0.05)

The hatchability and embryo mortality of enhanced local versus local chickens are showed in the Table (4), hatchability is (67.27 ± 1.05%) (69.69 ± 1.60%) in improvements and local respectively at significant level (P = 0.27). Fertile egg hatchability was improved locally (75.05 ± 1.26%) and locally (76.71 ± 1.21%), with a P-value of 0.39. The local (33.33 ± 2.25%) and local (30.40 ± 2.08%) embryo mortality rates improved, at significant level P-value of 0.39. equivalent hatchability rates and embryo survival under controlled incubation indicate that improved and local varieties have equivalent reproductive viability, as indicated by the lack of statistically significant differences (P > 0.05). These results agreed with those [22] where that is the thing they found that Early lacking mortality could be credited to chromosomal deviations and dangerous characteristics, which suggests that nascent creature perseverance is a quality of both sire and dam [23]. Saudi environment-adapted chickens carrying the Na or F genes are preferred. Also [24] showed that none significant differences in embryo dead rate between local and exotic breed.

Table (4): Hatchability, total eggs and fertile eggs and % of dead embryo between local and Iraqi black line (M±SE).

Genotypes	**Hatchability %**		**Dead embryo (%)**
	Hatchability of total eggs (%)	**Hatchability of fertile eggs (%)**	
Improved local	67.27 ±1.05 A	75.05 ±1.26 A	33.33 ±2.25 A
Local chickens	69.69 ±1.60 A	76.71 ±1.21 A	30.40 ±2.08 A
P.value	0.27	0.39	0.39

Means within the same column of similar litters are not significantly different at (P > 0.05)

Particularly the differences in activity levels and the frequency of abnormal between local and Iraqi black line. There was a significant difference between the activity levels of local chickens and improved bred (8.36 ± 0.08) and (7.40 ± 0.10) respectively. Local chickens were more vigorous. the local chickens (0.33 ± 0.33), the improved local chickens had a larger percentage of aberrant chicks (1.66 ± 0.88). local breed has less abnormalities after hatching, at P-value of 0.057.

These results were in same results with [25], in which they announced that breed types and hereditary constituents impacted the quality and movement of the chicks that brought forth from overweight-sized eggs of top caliber, high body weight, and high action.

The egg weight during hatching was essentially influenced by both genotype and egg weight. When compared to the stander breeds.

Table (5): Chick quality (Activity and abnormal) chicks between local and Iraqi black lines(M±SE).

Genotypes	Chick quality	
	Activity of chicks	Abnormal chicks
Improved local	7.40 ±0.10 B	1.66 ±0.88 A
Local chickens	8.36 ±0.08 A	0.33 ±0.33 B
P. value	0.002	0.057

Means within the same column of different litters are significantly different at (P ≤ 0.05).

Immune Response to ND and IBD in Better Local vs. Local Chickens this result presented in table (6) the result show Iraqi black line significantly higher ND antibody titers (17730.33 ± 1009) than local chickens (2938.01 ± 1068) at (P = 0.002), indicating a n stronger ND immune response and for IBD Antibody Titer improved local breed also displayed higher IBD titers (31412.66 ± 6169) than local chickens (15955.33 ± 7338).
In a study which explained how the anti-IBDV antibodies in the two lines, one of line has more mortality than another. Despite the fact that both social situations had high levels of killing antibodies, the White Leghorn chicks tended to promote larger levels of killing antibodies, which is exactly what the data demonstrated. This outcome may have to do with the capacity to develop a more beneficial immune response to IBDV infections following immunization [26].

Table (6): comparative of immunology traits between local and Iraqi black line (M±SE).

Genotypes	ND	IBD
Improved local	17730.33 ±1009 A	31412.66 ±6169 A
Local chickens	2938.01 ±1068 B	15955.33 ±7338 B
P. value	0.002	0.057

Means within the same column of different letters are significantly different at (P ≤ 0.05).

According to these results, better local chickens may be more resistant to disease in poultry production systems because they have a stronger immune response to ND and possibly IBD. More research is necessary to fully comprehend the effects on productivity and long-term health.

This study cleared that genetic groups have statistically significant on egg weight, activity of chicks and immunity, in spite of statistical differences in hatchability percentage and embryonic dead traits, based on the analysis of Iraqi local chicks had higher immunity in term of Newcastle and Gambaro diseases than Kurdish local chick.

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