



## Original Article

# Assessment of Egg Quality and Biochemical Parameters of Desi and Fayoumi Chicken Breeds of Kashmir Under Backyard Farming Conditions

Shahid Ali Jakhrani<sup>1</sup>, Javed Ahmed Ujan<sup>1</sup>, Shaista Ghumro<sup>1</sup> and Parvez Ali<sup>1</sup>

<sup>1</sup>Department of Zoology, Shah Abdul Latif University, Khairpur, Pakistan

## ARTICLE INFO

### Keywords:

Laying Chickens, Yolk Cholesterol, Egg Manufacturing, Egg Accuracy

### How to cite:

Jakhrani, S. A., Ujan, J. A., Ghumro, S., & Ali, P. (2025). Assessment of Egg Quality and Biochemical Parameters of Desi and Fayoumi Chicken Breeds of Kashmir Under Backyard Farming Conditions: Desi and Fayoumi Chicken Breeds of Kashmir Under Backyard Farming Conditions. *MARKHOR (The Journal of Zoology)*, 6(1), 32-36. <https://doi.org/10.54393/mjz.v6i1.144>

### \*Corresponding Author:

Shahid Ali Jakhrani  
Department of Zoology, Shah Abdul Latif University, Khairpur, Pakistan  
[shahid.jakhrani@salu.edu.pk](mailto:shahid.jakhrani@salu.edu.pk)

Received date: 25<sup>th</sup> January, 2025

Acceptance date: 14<sup>th</sup> March, 2025

Published date: 31<sup>st</sup> March, 2025

## ABSTRACT

The egg quality factors and configuration are significant influences on grading and price. Hatching ability, weight, and consumer preference. **Objectives:** To evaluate and compare the egg quality criteria of two economically significant breeds of backyard-raised chickens such as Desi and Fayoumi. **Methods:** A variety of interior and exterior egg quality metrics were measured such as triacylglycerol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and cholesterol, which were the estimated biochemical characteristics of egg yolk. **Results:** Means for Desi egg's external characteristics, such as weight, length, width and thickness were 52.43 g, 5.16 cm, 3.85 cm, and 0.39 mm respectively. Fayoumi egg's equivalent values were 50.55g, 5.13 cm, 3.79 cm, 74.02%, 6.55 g and 0.34 mm. For Desi eggs, the yolk was 16.87 g, the albumin weight was 26.45 g, the breaking strength was 2.90, and the Haugh unit was 76.5. The Fayoumi chicken breed's egg had the following characteristics albumin weight of 26.27 g, breaking strength of 1.95, Haugh unit of 74.3, and yolk weight of 16.25 g. The calculated mean values for HDL, LDL, triacylglycerol, and egg yolk cholesterol were 9.38, 1.74, 0.17, and 1.94 mg/g for Desi eggs and 8.38, 1.84, 0.11, and 1.76 mg/g for Fayoumi eggs. **Conclusions:** It was concluded that Fayoumi eggs are heavier and better FCR than desi eggs due to breed, management conditions, nutrition, or environmental factors.

## INTRODUCTION

Because of their superior molecular adaptation to local environmental circumstances, resistance to certain illnesses, high level of immunological competence, and strong and well-formed eggshells, local chicken breeds or strains are regarded as a priceless genetic gems. Even though indigenous strains often have poor productivity, several genetic modification techniques can increase their output. It's critical to strengthen eggshells for parents, grandparents, and egg-laying stocks. [1]. Fayoumi is an ancient breed that originated from Egypt in the place called Fayoumi and so they are also known as Egyptian Fayoumi. They are medium-sized chickens, the Fayoumi hen is the best layer among the various breeds. Fayoumi chickens have big black eyes and erect tails, despite their diminutive stature [2]. Their huge, single-comb silvery head, onyx-

dark eyes and thin, black-speckled body are sometimes associated with roadrunners due to their forward-jutting neck and breasts as well as their erect tails. Fayoumi chickens are known for their dark horn-colored beaks and state blue skin [3]. Hen's head and neck are gleaming white, while the rest of their bodies are barred. The plumage of Fayoumi rooster is silver-white on the head, neck, saddle and back, while the remainder is black and white [4]. Desi eggs are the main Pakistani food and boast an unparalleled richness in flavor and nutritional value. These eggs produced by free-range chickens are prized for their superiority over commercially produced eggs in terms of taste and nutritional content. With a storied history in Pakistani culinary traditions. Desi eggs have been a fundamental ingredient in numerous iconic dishes. They

are a cornerstone of breakfast recipes, elevating omelets, frittatas and quiches to new heights [5]. Moreover, Desi eggs seamlessly integrate into lunch and dinner staples such as biryani and korma adding depth and complexity to these beloved meals. Beyond their culinary significance, Desi eggs possess medicinal properties that alleviate various ailments [6]. This remarkable egg has woven itself into the fabric of Pakistani culture, transcending its role as a simple ingredient to become an integral part of the country's gastronomic heritage and traditional remedies [7]. The Desi egg is an exemplary nutrient-dense food, boasting an impressive array of essential vitamins, minerals and protein. Its nutritional profile is further enhanced by the presence of healthy fats and antioxidants which play a vital role in safeguarding the body against various diseases. In comparison to commercially produced eggs, the Desi egg stands out for its superior nutritional value, rendering it a healthier option for consumption. A single large Desi egg contains approximately 70 calories, complemented by 6 grams of protein and 5 grams of fat. Additionally, it serves as an excellent source of vital vitamins and minerals including vitamin A, vitamin D, and choline. For this reason, the Desi egg yolk is a very vital part of a healthy diet. [8].

This study aims to investigate and compare the egg quality criteria of two economically significant breeds of backyard-raised chickens such as Desi and Fayoumi.

**METHODS**

In this experimental search design, a total of 110 birds (32 weeks of age) were included. 50 female and 5 male from the Fayoumi and Desi chicken breeds were used in the study. Using the Power Analysis Formula:  $n = 2\sigma^2 (Z\alpha/2 + Z\beta)^2 / \Delta^2$ , data were collected. Where  $Z\alpha/2 = 1.96$  (95% confidence level),  $Z\beta = 0.84$  (80% power),  $\sigma$  = Standard deviation, and  $\Delta$  = Expected difference between means. The sample size was calculated by open Epi software. The birds were divided into 10 duplicates, each consisting of 5 repetitions and consisting of 1 cock and 10 hens. For 13 weeks, from January to March 2022, each group was raised in a separate section with 5.8 square feet of floor area and maintained under comparable management settings. The temperature and relative humidity within the shed were kept constant and were found to range between 26°C and 28°C and 55% and 65%, respectively. Every day, the birds were exposed to 16 hours of light. The experimental birds were fed commercial L5 layer feed for the duration of the trial after receiving ethical permission. A computerized weighing scale was used to weigh the weekly leftover feed. Eggs were collected without delay every day at 12:00 pm. After subtracting the leftover feed, the feed consumption ratio (FCR) was measured. Every day, eggs were weighed, and after each week, the average weight of the eggs was noted. Yolk index: A Vernier caliper was utilized to identify

the yolk's breadth and a tripod spherometer to determine its height. The yolk index was computed by multiplying the average yolk width by the average yolk height by 100. Haugh Unit: The log of albumin height times egg weight was the Haugh unit. Different formulas were used for measuring biological parameters. The weight of albumen = weight of an egg minus the weight of the yolk and shell, Albumen index = Albumen height (mm) / Albumen width (mm) × 100, Egg length (mm) = 14.7 × (Egg weight)<sup>0.341</sup>, Egg width (mm) = 11.3 × (Egg weight)<sup>0.327</sup>, Shape Index (%) = (Egg Width / Egg Length) × 100, Shell weight (g) = 0.0524 × (Egg Weight)<sup>1.113</sup>, Shell thickness (mm) = 0.0546 × (Egg Weight)<sup>0.44</sup>, The yellow ratio (%) = 0.346 × (egg weight)<sup>1.02</sup>. and Weight of egg yolk (g) = (weight of egg × yolk ratio) / 100. The Haugh Unit (HU) was determined according to the following formulation:  $HU = 100 \log (H - 1.7W^{0.37} + 7.57)$ . where W was the egg's mass in grams and H was the thick albumen's height in millimetres. A 10 g egg yolk sample was homogenized in 40 mL of solvent (chloroform: methanol; 3:1) for 5 minutes to extract the samples' total lipids. Before being put on the Buchner suction filter, the mixture was kept for ten minutes. After being combined, the organic filtrates were sent into a separating funnel. After pouring two litres of 0.88% aqueous potassium chloride, the funnel was violently shaken. After the funnel was left undisturbed for 12 hours, the non-lipid material was separated into the upper aqueous phase. Using the Friedewald formula, the LDL-C was calculated as follows:  $HDL\ C\ TG / 5\ LDL\ C\ TC$ . Where TG stands for triglycerides and TC for total cholesterol [9]. After removing the bottom layer, it had been dried over sodium sulfate. Methanol was added to clean the bottom phase after the top phase was removed. Lipid extract was dried in a water bath and then in a hot air oven at 60°C until it reached a consistent weight. TG, HDL, LDL, and cholesterol were calculated using the "ERBA System Pack" in an automated analyzer [10].

**RESULTS**

In contrast to Fayoumi chickens, Desi chickens had an elevated weekly feed consumption ratio per bird. Fayoumi birds were found to consume the least amount of feed each week. Both chicken breeds' average results are shown (Table 1).

**Table 1:** Mean Values for Various Fayoumi and Desi Layer Characteristics

Parameters	Desi Chicken Breed Mean ± SE	Fayoumi Chicken Breed Mean ± SE
FCR Eggs Dozen	2.453 ± 0.310	2.387 ± 0.137
Egg Weight	52.43 ± 3.401	50.55 ± 3.511
Production of Egg	3.65 ± 0.417	4.47 ± 0.259
FCR/Bird/Week Kg	0.739 ± 0.041	0.786 ± 0.055
FCR/ Egg Mass/ kg	4.215 ± 0.355	3.399 ± 0.251

The average values of all the parameters are shown.

According to the current study's outcomes, Fayoumi chickens had larger albumin and egg yolk weights than Desi hens, and the week had a greater impact on the egg yolk weight. Fayoumi chickens had greater shell strength findings than Desi chickens, and the first week of the trial showed the highest breaking energy (Table 2).

**Table 2:** Various Traits of Quality of Eggs for Desi and Fayoumi Chicken Breeds

Parameters	Desi Chicken Breed Mean ± SE	Fayoumi Chicken Breed Mean ± SE
Yolk Weight (Grams)	16.87 ± 1.055	16.25 ± 1.91
Egg Length (cm)	5.16 ± 0.04	5.13 ± 0.03
Breaking Strength	2.90 ± 0.141	1.95 ± 0.075
Haugh Unit	76.5 ± 8.243	74.3 ± 6.876
Yolk Index	0.467 ± 0.031	0.437 ± 0.021
Shell Thickness	0.39 ± 0.013	0.34 ± 0.011
Shell Weight (Grams)	7.57 ± 0.645	6.55 ± 0.611
Albumin Weight (Grams)	26.45 ± 3.317	26.27 ± 0.195
Shape Index (%)	74.75 ± 0.47	74.02 ± 0.46

The HDL levels in the egg yolks of Desi and Fayoumi hens were. Egg yolk LDL levels in Desi and Fayoumi hens were 0.17 ± 0.01 and 0.11 ± 0.01 mg/g, respectively. In Desi and Fayoumi hens, the levels of egg yolk TG were 1.94 ± 0.05 and 1.76 ± 0.04 mg/g, respectively (Table 3).

**Table 3:** Parameters of Desi and Fayoumi Chicken Breeds

Parameters	Desi Chicken Breed		Fayoumi Chicken Breed	
	Mean ± SE	CV (%)	Mean ± SE	CV (%)
TDC (mg/g)	9.38 ± 0.02	1.50	8.38 ± 0.01	1.05
HDL (mg/g)	1.74 ± 0.03	14.97	1.84 ± 0.03	12.50
LDL (mg/g)	0.17 ± 0.01	53.11	0.11 ± 0.01	52.97
TG (mg/g)	1.94 ± 0.05	18.36	1.76 ± 0.04	17.59

## DISCUSSION

In comparison to Desi chickens, the birds in this research generated more eggs. Additionally, in comparison to Desi hens, Fayoumi delivered heavier eggs with a higher FCR per dozen. Fayoumi birds were found to consume the least amount of feed each week [11]. According to earlier research, Desi birds' feed consumption ratio was considerably higher than Rhode Fayoumi birds during the eighth week of the trial [12]. When compared to Desi chicken breeds, it was found that Fayoumi birds displayed the lowest feed consumption ratio values. Our results are consistent with earlier research showing that specific layer strains impacted feed consumption in comparison to other diets. It was generally accepted that FCR was a heritable trait and that the reason why Fayoumi and Desi birds consume the most feed may be because they engage in varied physical activities on the farm, where their bodies can efficiently use the most feed for a variety of purposes. In our investigation, we found that Fayoumi birds produced heavier and much higher ( $p < 0.05$ ) eggs than Desi birds [13]. Genetic potential and improved management

circumstances with appropriate feeding, immunization, and treatment throughout the laying phase may be the cause of the variance in egg weight and production [14]. According to Świątkiewicz et al., under intensive circumstances, an average number of phenotypic traits such as the neck length of Desi and Fayoumi male recorded in cm ( $20.4 \pm 1.9$ ), the wingspan ( $23.7 \pm 1.6$ ) ( $18.3 \pm 1.5$ ), the shank length ( $12.5 \pm 0.82$ ) ( $8.3 \pm 0.72$ ). In contrast, both the Desi and Fayoumi male neck length ( $18.7 \pm 1.6$ ) ( $16.4 \pm 1.3$ ) and body height ( $38.7 \pm 3.2$ ) ( $34.6 \pm 3.1$ ) were measured in the free range circumstances [15]. According to Ali S et al., the ratios associated with internal quality traits, such as albumen index (%), yolk index (%), the weight of albumen (g), the weight of yolk (g) were  $0.058 \pm 0.009$ ,  $35.15 \pm 6.08$ ,  $43.60 \pm 2.07$ ,  $56 \pm 9.25$  respectively [16]. The findings of a different study showed that the eggshell thickness (cm), egg yolk index (%), egg shape index (%), and were  $0.381 \pm 0.003$ ,  $47.25 \pm 0.113$ ,  $77.003 \pm 0.176$ ,  $11.915 \pm 0.243$ ,  $6.001 \pm 0.017$ ,  $3.791 \pm 0.032$  [17]. Other results showed that the average albumen elevation of Fayoumi breed was 6.6 and its weight was 26.0. The length of the egg was 5.0 and its width was 44.3 [18]. In this study, the average age and weight at sexual maturity were  $1215 \pm 11.12$ g and  $183.5 \pm 5.60$  days, respectively. Hen day egg production was  $41.23 \pm 15.97\%$ , while the average yearly egg output was  $150.47 \pm 3.15$  eggs/hen/year. The mean values for the form index and egg weight were  $75.95 \pm 2.81$  and  $44.68 \pm 3.63$ g, respectively, while the yolk colour, albumen weight, yolk weight, shell weight, and shell thickness were  $5.89 \pm 3.58$ ,  $14.54 \pm 1.36$ g,  $24.61 \pm 2.67$ g,  $5.63 \pm 0.76$ g, and  $0.36 \pm 0.04$ mm, respectively. In terms of hatchability rate, 78.22% of the set of Fayoumi eggs hatched. In the Leta et al., investigation, a higher death rate of 54.85% was noted [19]. Fayoumi had the lowest average day-old weight, while Desi had the intermediate one. With 41%, the maximum generation of eggs was achieved, trailed by the Desi breed (29%), and Fayoumi (36%). The Desi breed has a lower feed effectiveness (g feed: g egg mass) (8.70) than the Fayoumi (6.79) [20].

## CONCLUSIONS

It was concluded that the Fayoumi eggs are heavier and better FCR than desi eggs due to breed, management conditions, nutrition, or environmental factors.

## Authors Contribution

Conceptualization: SAJ, JAU

Methodology: SAJ, SG, PA

Formal analysis: SAJ, SG

Writing review and editing: SAJ

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

All the authors declare no conflict of interest.

## Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

## REFERENCES

- [1] Cayan H and Erener G. Effect of Olive Leaf (*Olea Europaea*) Powder On Laying Hens Performance, Egg Quality and Egg Yolk Cholesterol Levels. *Asian-Australasian Journal of Animal Sciences*. 2015 Apr; 28(4): 538. doi: 10.5713/ajas.14.0369.
- [2] Tomaszewska E, Dobrowolski P, Kostro K, Jakubczak A, Taszkun I, Jaworska-Adamu J et al. Effect of HMB and 2-Ox Administered During Pregnancy On Bone Properties in Primiparous and Multiparous Minks (*Neivison Vison*). *Journal of Veterinary Research*. 2015; 59(4): 563-8. doi: 10.1515/bvip-2015-0084.
- [3] Xue H, Qin R, Xi Q, Xiao S, Chen Y, Liu Y et al. Maternal Dietary Cholesterol and Egg Intake During Pregnancy and Large-For-Gestational-Age Infants: A Prospective Cohort Study. *The Journal of Nutrition*. 2024 Jun; 154(6): 1880-9. doi: 10.1016/j.tjn.2024.04.011.
- [4] Nagaoka K, Mulla J, Cao K, Cheng Z, Liu D, Mueller W et al. The Metabolite, Alpha-Ketoglutarate Inhibits Non-Alcoholic Fatty Liver Disease Progression by Targeting Lipid Metabolism. *Liver Research*. 2020 Jun; 4(2): 94-100. doi: 10.1016/j.livres.2020.04.001.
- [5] Omidi M, Rahimi S, Torshizi MA. Modification of Egg Yolk Fatty Acids Profile by Using Different Oil Sources. *Oilseeds Focus*. 2020 May; 6(2): 39-41.
- [6] Franczyk-Żarów M, Szymczyk B, Kostogryś RB. Effects of Dietary Conjugated Linoleic Acid and Selected Vegetable Oils or Vitamin E On Fatty Acid Composition of Hen Egg Yolks. *Annals of Animal Science*. 2019; 19(1): 173-88. doi: 10.2478/aoas-2018-0052.
- [7] Thang PQ, Jitae K, Giang BL, Viet NM, Huong PT. Potential Application of Chicken Manure Biochar Towards Toxic Phenol and 2, 4-Dinitrophenol in Wastewaters. *Journal of Environmental Management*. 2019 Dec; 251: 109556. doi: 10.1016/j.jenvman.2019.109556.
- [8] Kaya H and Macit M. Effect of Inclusion of Garlic (*Allium Sativum*) Powder at Different Levels and Copper into Diets of Hens On Performance, Egg Quality Traits and Yolk Cholesterol Content. 2012; 11(2): 114-119. doi: 10.3923/ijps.2012.114.119.
- [9] Alpdemir M and Alpdemir MF. Comparison of Martin and Friedewald Equation for Estimated LDL-C in Adults. *Turk Kardiyoloji Dernegi Arsivi*. 2021 Dec; 49(8): 619. doi: 10.5543/TKDA.2021.90446.
- [10] Kumar M, Dahiya SP, Ratwan P, Sheoran N, Kumar S, Kumar N. Assessment of Egg Quality and Biochemical Parameters of Aseel and Kadaknath Indigenous Chicken Breeds of India Under Backyard Poultry Farming. *Poultry Science*. 2022 Feb; 101(2): 101589. doi: 10.1016/j.psj.2021.101589.
- [11] Jakhrani SA, Ujan JA, Ujjan SA. Study The Effects of Ecological Conditions On Desi and Fayoumi Chicken Traits at Sindh, Pakistan. *Pakistan Journal of Biotechnology*. 2024; 21(1): 80-6. doi: 10.34016/pjbt.2024.21.01.837.
- [12] Schiebelhut LM, Abboud SS, Gómez Daglio LE, Swift HF, Dawson MN. A Comparison of DNA Extraction Methods for High-Throughput DNA Analyses. *Molecular Ecology Resources*. 2017 Jul; 17(4): 721-9. doi: 10.1111/1755-0998.12620.
- [13] Taha AE and Abd El-Ghany FA. Improving Production Traits for El-Salam and Mandarrah Chicken Strains by Crossing I-Estimation of Cross-Breeding Effects for Growth Production Traits. *Alexandria Journal of Veterinary Sciences*. 2013; 39(1): 18-30.
- [14] Tekwe CD, Yao K, Lei J, Li X, Gupta A, Luan Y et al. Oral Administration of  $\alpha$ -Ketoglutarate Enhances Nitric Oxide Synthesis by Endothelial Cells and Whole-Body Insulin Sensitivity in Diet-Induced Obese Rats. *Experimental Biology and Medicine*. 2019 Oct; 244(13): 1081-8. doi: 10.1177/1535370219865229.
- [15] Świątkiewicz S, Arczewska-Włosek A, Szczurek W, Calik J, Bederska-Łojewska D, Orczewska-Dudek S et al. Algal Oil as Source of Polyunsaturated Fatty Acids in Laying Hens Nutrition: Effect On Egg Performance, Egg Quality Indices and Fatty Acid Composition of Egg Yolk Lipids. *Annals of Animal Science*. 2020 Jul; 20(3): 961-73. doi: 10.2478/aoas-2020-0019.
- [16] Ali S, Ujan JA, Ujjan SA. The Effect of Ecological Conditions On Desi and Fayoumi Chicken Traits at District Kashmir, Sindh-Pakistan. *Pakistan Journal of Biotechnology*. 2024 Feb; 21(1): 80-6. doi: 10.34016/pjbt.2024.21.01.837.
- [17] Gogoi A, Das B, Phookan A, Chabukdhara P, Pathak SS, Pame K et al. Evaluation of Physical Egg Quality Traits in Indigenous Geese of Upper Assam. *International Journal of Genetics ISSN (2021)*. 2021: 0975-2862.
- [18] Breeds EC. Comparative Evaluation of Egg Quality Traits in Two. *Journal of Food Chemistry and Nanotechnology | Volume*. 2024; 10(1): 12. doi: 10.17756/jfcn.2024-169.
- [19] Leta S, Bekana E, Geleta T. Production Performance of Fayoumi Chicken Breed Under Backyard Management Condition in Mid Rift Valley of Ethiopia.



Herald Journal of Agriculture and Food Science Research. 2013 Jan; 2(1): 078-81.

- [20] Khawaja T, Khan SH, Mukhtar N, Ali MA, Ahmed T, Ghafar A. Comparative Study of Growth Performance, Egg Production, Egg Characteristics and Haemato-Biochemical Parameters of Desi, Fayoumi and Rhode Island Red Chicken. Journal of Applied Animal Research. 2012 Dec; 40(4): 273-83. doi: 10.1080/09712119.2012.672310.