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Comparison of egg quality traits of Chara and Chemballi varieties of Kuttanad ducks

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Abstract

As part of genetic diversity analysis between two varieties of Kuttanad ducks egg quality traits of Chara and Chemballi varieties of Kuttanad ducks under farm conditions was compared and assessed. The egg quality traits recorded at 40 weeks of age were satisfactory for both the groups. Standard procedures were performed to find out the various egg quality measurements. The mean value for shape index, albumen index, yolk index, and Haugh unit score of egg of Chara ducks was 77.22, 0.115, 0.408 and 91.07, respectively whereas the corresponding values of eggs of Chemballi ducks were 77.10, 0.112, 0.410 and 91.79, respectively. These differences in average values between the two varieties were statistically comparable between the two varieties. The shell thickness recorded for both eggs was 0.38 mm. The difference in mean per cent yield for shell, albumen and yolk was statistically significant ($p < 0.01$) between the eggs of Chara and Chemballi ducks.

Keywords: Egg quality, Chara ducks, Chemballi ducks, shell thickness

Introduction

Among the diversified poultry species, ducks reared for their meat and eggs are very much valued all over the world. Indigenous or native duck breeds constitute the majority of ducks raised in India, accounting for 10 percent of the total backyard poultry population, as reported in the 20th Livestock census, which stands at 317.07 million. Indian native breeds of ducks are popular for their peculiar qualities of adaptation, thriving capability against diseases, meat and egg production. Native duck breeds are becoming more and more well-liked across the globe as a result of their improved capacity to adapt to local environmental conditions and strong immune status (Iqbal *et al.*, 2012) ^[1]. Kerala is one of the few leading producer and consumer states in the India for duck eggs, where the price of duck eggs exceeds that of chicken eggs. The unique capacity to adapt to local environmental circumstances and strong immune attributes, the native duck breeds have grown acceptable across the globe. In Kerala above 90 per cent of total duck population is made up of native ducks. The two primary types of Kuttanad ducks with strong egg production potential are Chara and Chemballi, among them. Farmers are getting nutritional and economic security with these native breeds than the exotic ones because of their low cost management and ease of rearing. Nowadays egg quality parameters are of paramount importance in the egg industry because they impact grading, pricing, hatchability and consumer choice. Furthermore, quality and yield of chicks at hatch is greatly dependent on the internal egg properties (Rehman *et al.*, 2017) ^[2]. Eggshell thickness is the most critical factor affecting fertility and hatchability rates, and for ideal gas exchange, pipping, and moisture retention, eggshells must be free of any malformations like hair-line cracks. Due to this, the majority of breeding firms emphasize traits that improve the quality of eggs (Bain, 2005; Sekeroglu & Altuntas, 2009) ^[3, 4]. Periodic assessment of egg quality traits in indigenous ducks is essential for preserving genetic diversity, improving production practices, meeting consumer preferences, enhancing economic viability, promoting health and nutrition and contributing to sustainable agriculture. This research and evaluation are critical for the overall well-being of indigenous duck breeds and the communities that rely on them for livelihood and nutrition. Considering the above facts, an attempt was undertaken to assess and record the physical quality characteristics of eggs of Chara and Chemballi varieties of Kuttanad ducks kept in intensive system of housing.

Materials and Methods

The trial was carried out in the Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy, to evaluate and compare the quality traits of eggs procured from Chara and Chemballi varieties of ducks maintained in cage system of rearing. A total of 150 eggs hundred eggs from each group were collected over a period of three consecutive days from ducks at forty weeks of age. The procurement and assessment of eggs were done on the same day of laying. Identical management and feeding practices were followed for both the varieties. The egg quality traits determined were specific gravity, shape index, yolk index, albumen index, Haugh Unit score and shell thickness. The length and breadth of the egg were measured using Vernier caliper. The height of albumen and yolk was measured using tripod stand micrometer. The width of yolk and albumen was measured using Vernier caliper. Yolk colour of the eggs was compared with the standard colours available in the Roche's yolk colour fan (15 colours ranging from light yellow to deep orange) and scoring was done accordingly. The shell thickness was measured using screw gauge. Shell thickness (mm) without shell membrane was measured at three places viz., equatorial region, narrow end and broad end by using a screw gauge with 0.001mm accuracy and mean thickness was calculated as per Tylor and Geake (1961) [5]. Egg was broken and yolk was carefully separated and weighed to the nearest gram. Albumen was scrapped by a scrapper in to a Petri dish and weighed. Shell weight was also determined after removing the shell membranes and drying overnight in hot air oven. The shape index, albumen index, yolk index and Haugh unit score were calculated by applying the formulae given below.

Shape index = $\text{Breadth of egg (mm)} / \text{Length of egg (mm)}$
x 100

Yolk index = $\text{Height of yolk (mm)} / \text{Diameter of yolk (mm)}$

Albumen index = $\text{Height of thick albumen (mm)} / \text{Mean width of thick albumen (mm)}$

The height of the thick albumen measured by tripod stand micrometer and the weight of the egg was used for calculation of Haugh unit score as per Stadelman (1986) [6]. The following formula was used for the calculation.

H.U.S = $100 \log (H+7.57-1.7 W^{0.37})$

Where

H is the height of thick albumen (mm) and W is the weight of egg (g).

Results

The quality traits were determined at 40 weeks of age and the findings are presented in Table 1. At 40 weeks of age, there were no statistically significant difference between the mean egg shape index values for Chara (77.20) and Chemballi ducks (77.10). Eggs from Chara and Chemballi had similar average albumen index values of 0.115 and 0.112, respectively. The mean yolk index of eggs in Chara (0.408) and Chemballi (0.410) did not differ significantly.

The mean shell thickness of eggs was 0.38 mm both in Chara and Chemballi. The mean Haugh unit score was 91.07 and 91.79 in Chara and Chemballi, respectively and the difference

in mean values was not statistically significant. The difference in mean per cent yield of shell in Chara (10.67 per cent) was significantly ($p < 0.01$) higher than that of Chemballi (10.19 per cent). The mean per cent yield of albumen in Chara (56.91 per cent) was significantly ($p < 0.01$) higher than that of Chemballi (55.26 per cent). The difference in mean per cent yield of yolk in Chemballi (34.26 per cent) was significantly ($p < 0.01$) higher than that of Chara (31.83 per cent).

Table 1: Mean (\pm SE) values for egg quality traits of Chara and Chemballi eggs at 40 weeks of age

Traits	Chara	Chemballi	p-value
Specific gravity	1.094 \pm 0.001	1.094 \pm 0.001	0.876
Shape index	77.22 \pm 0.26	77.10 \pm 0.39	0.787
Albumen index	0.115 \pm 0.001	0.112 \pm 0.001	0.090
Yolk index	0.408 \pm 0.003	0.410 \pm 0.004	0.637
Shell thickness (mm)	0.38 \pm 0.02	0.38 \pm 0.03	0.855
Haugh unit score	91.07 \pm 0.49	91.79 \pm 0.47	0.287
Shell (%)	10.67 \pm 0.05	10.19 \pm 0.07	0.001**
Albumen (%)	56.91 \pm 0.17	55.26 \pm 0.14	0.001**
Yolk (%)	31.83 \pm 0.18	34.26 \pm 0.18	0.001**
Yolk colour	2.67 \pm 0.06	2.69 \pm 0.04	0.855

** Significant at ($p < 0.01$)

Discussion

The egg quality traits studied at 40 weeks of age in Chara and Chemballi varieties set out in Table 1 revealed that both Chara and Chemballi eggs possess satisfactory egg traits. The mean shape index values of Chara and Chemballi were statistically comparable and revealed that all eggs were of normal shape. The shape index value of eggs for both varieties were slightly greater than the corresponding values reported by Mahanta *et al.* (1998) [7] in Chara and Chemballi ducks, Mahanta *et al.* (2009) [8] in Chara- Chemballi ducks of Assam, Harikrishnan and Ponnuvel (2012) [9] in Kuttanad ducks and Bharali *et al.* (2020) [10] in Chara Chemballi ducks of Assam. The difference in mean albumen index values of eggs of Chara and Chemballi was not statistically significant. The mean albumen index values are comparable to the values reported by Mahanta *et al.* (1998) [7] in Chara and Chemballi ducks, Mahanta *et al.* (2009) [8] in Chara- Chemballi ducks of Assam, Niranjan and Datt (2009) [11] in native ducks of Tripura and Phookan *et al.* (2018) [12] in Nageswari ducks but slightly lower than the values of Harikrishnan and Ponnuvel (2012) [9] in Kuttanad ducks and Padhi *et al.* (2023) [13] in Kuzi ducks of Orissa. The mean yolk index value of eggs in Chara and Chemballi did not differ significantly. The values were similar to the values reported by Mahanta *et al.* (2009) [8] in Chara- Chemballi ducks of Assam, Niranjan and Datt (2009) [11] in native ducks of Tripura and Padhi *et al.* (2023) [13] in Kuzi ducks of Orissa but slightly lower than the values of Mahanta *et al.* (1998) [7] in Chara and Chemballi ducks, Phookan *et al.* (2018) [12] in Nageswari ducks and Manipur local ducks. Slightly lower value for yolk index was reported by Harikrishnan and Ponnuvel (2012) [9] in Kuttanad ducks. The difference in mean values for yolk colour was comparable between the two groups and colour score was lower than the values reported by and Ponnuvel (2012) [9] in Kuttanad ducks and Phookan *et al.* (2018) [12] in Pati, Nageswari, Tripura local and Manipur local ducks. The lower yolk colour might be due to alterations in feed composition. There was no statistical significance between the difference in shell thickness of eggs of Chara and Chemballi. The mean shell thickness of Chara and Chemballi eggs were similar to that reported by Mahanta *et al.* (1998) [7] in Chara and

Chemballi ducks and Phookan *et al.* (2018)^[12] in Manipur local ducks. The shell thickness was slightly higher than the values reported in Kuttanad ducks by Harikrishnan and Ponnuvel (2012)^[9] and lower than the values reported in Chara- Chemballi ducks of Assam by Mahanta *et al.* (2009)^[8] and Bharali *et al.* (2020)^[10]. The specific gravity and eggshell thickness are highly positively correlated. The mean specific gravity obtained for both varieties in this study was in agreement with the findings of Mahanta *et al.* (1998)^[7] in Chara and Chemballi ducks but slightly lower values were reported by Mahanta *et al.* (2009)^[8] in Chara- Chemballi ducks of Assam and Harikrishnan and Ponnuvel (2012)^[9] in Kuttanad ducks. The mean Haugh unit scores were statistically similar for Chara and Chemballi ducks and results were in agreement with the findings of Mahanta *et al.* (1998)^[7] in Chara and Chemballi ducks and Mahanta *et al.* (2009)^[8] in Chara- Chemballi ducks of Assam. The Haugh unit scores were higher than those reported by Niranjana and Datt (2009)^[11] in Khaki Campbell and native duck eggs from Tripura and Phookan *et al.* (2018)^[12] in Pati, Nageswari, Tripura local and Manipur local ducks but lower than the mean Haugh unit score recorded by Harikrishnan and Ponnuvel (2012)^[9] in Kuttanad ducks.

There was statistically significant difference between the per cent yields of shell, albumen and yolk of Chara and Chemballi eggs. The per cent yields of shell was similar to the finding of Harikrishnan and Ponnuvel (2012)^[9] in Kuttanad ducks but lower than that of Mahanta *et al.* (1998)^[7] in Chara and Chemballi ducks. The albumen per cent of the present study was slightly lower than that reported in Chara and Chemballi ducks by Mahanta *et al.* (1998)^[7] and *vice versa* for per cent yields of yolk.

Conclusion

Both Chara and Chemballi eggs possess satisfactory values for all the egg quality traits measured. The difference in mean per cent yield of shell, albumen and yolk between the two varieties significantly. The information on egg quality traits of Chara and Chemballi is very useful as limited information is available which will strengthen the published scientific data and also help the farmers in choosing the good quality eggs and ducks suitable for backyard rearing.

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