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External and internal egg quality traits of indigenous chicken of Gulbarga division reared under field conditions

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Abstract

A study was carried at Department of Poultry Science, Veterinary College, Bengaluru, to evaluate the egg parameters of indigenous chicken of Gulbarga division of Karnataka state under field conditions for external and internal egg quality traits. Evaluation of the external and internal quality of eggs is important because of consumer preferences for better quality eggs. The external egg quality traits studied were egg shell color, egg weight and shape index. The internal quality traits studied were albumin index, yolk index, shell weight and Haugh Unit Score. The percentage of different shell colors of eggs recorded under field conditions were 14.99 creamy, 38.64 light brown and 46.37 brown color. The average Egg weight, Shell weight, Shape index, Albumin index, Haugh Unit score and Yolk index recorded were 38.83 ± 1.37 g, 3.86 ± 0.27 g, 71.34 ± 1.23 , 0.064 ± 0.010 , 68.89 ± 1.24 and 0.381 ± 0.0045 , respectively.

Keywords: egg quality traits, Indigenous chicken, field conditions, albumin index, yolk index, shape index and haugh unit score

Introduction

India with a population of 1.37 billion people is highly focusing on “Development” i.e. Good Food, Better Health & living conditions for everyone. With the increase in the incomes, people can now afford better nutrition and hence the demand for egg and chicken is increasing. Approximately 75 percent of egg production is contributed by commercial poultry farms, remaining comes from household/backyard poultry. Egg production is around 95.2 billion; ICMR recommendation is 180 eggs per person per year but per capita availability (PCA) is around 74 during 2017-18 (Annual Report GOI). India aims to produce 106 billion eggs and reach a PCA of 81 eggs per annum by 2020. It is generally agreed that all the characteristics of egg quality have a genetic basis. Egg quality has been defined by Stadelman (1977) [16] as the characteristics of an egg that affect its acceptability by the consumers. Egg quality is the more important price contributing factor in table eggs and hatching eggs. Therefore, the economic success of a laying flock solely depends on the total number of quality eggs produced. Quality of chicken eggs may vary due to several factors like rearing, temperature, relative humidity and season in which the birds are reared. The present investigation was undertaken to assess the various egg quality characteristics in indigenous chicken of Gulbarga division of Karnataka.

Material and Methods

The present study was conducted in the department of Poultry Science, Veterinary College, Bengaluru. Eggs were collected from each district of indigenous chicken reared under scavenging system from different villages of Gulbarga division of Karnataka state viz., Bidar, Gulbarga and Koppala. The collected eggs were subjected to internal and external quality parameters. Egg shell color was observed and eggs were weighed individually to the accuracy of 0.01g. Shape index of egg was recorded by using vernier caliper to measure length and width of the collected eggs. To study the internal qualities of the collected eggs, these eggs were broken on level surface to measure height of thick albumin and yolk at three different points by using spherometer. The width of albumin and yolk were measured using vernier calliper to find albumin index, yolk index and Haugh unit score.

The data was subjected to one way analysis of variance (ANOVA) using SPSS statistical software (Version 20 for windows, SPSS). Values were expressed as mean \pm SE. Means were compared by Duncan's test to determine significance between treatments. Significance of difference between treatments was determined at the $p \leq 0.05$.

Results and Discussion

Appearance of eggs is influenced by severity of defects and importance for consumer appeal (Jacqueline *et al.*, 2000) [6]. The fertility and hatchability of laying eggs is affected by egg quality, many factors effects egg qualities like breed/strain, health status, season, rearing temperature, relative humidity and nutrition.

A. External egg quality traits

1. Egg shell color

The percentage of various egg shell colors of indigenous chicken of Gulbarga Division are presented in Table 1. The overall percentage of eggs shell colors recorded under scavenging system were 14.99, 38.64 and 46.37 for creamy, light brown and brown color, respectively. The percentage of cream color eggs recorded were 17.27 in Bidar, 11.84 in Gulbarga and 15.86 in Koppala districts. The percentage of light brown color eggs recorded were 38.28 in Bidar, 41.78 in Gulbarga and 35.86 in Koppala districts. The percentage of brown color egg documented were 44.45 in Bidar, 46.38 in Gulbarga and 48.28 in Koppala districts. The result of present study are in agreement with the findings of Tantia *et al.* (2006a) [18] in Ankaleshwar, Vijh *et al.* (2005a) [27] in Nicobari fowl, Vij *et al.* (2007) [22] in Tellichery and Gopinath (2013) [4] in indigenous chicken of Mysore division. Few other shell colors were also recorded like dark brown, white and creamy white as reported by Vij *et al.* (2005) [24] in Danki, Vijh *et al.* (2005a) [27] in Miri, Tantia *et al.* (2005b) [19] in Ghagus, Parmar *et al.* (2006) [11] in Kadaknath, Vij *et al.* (2007) [22] in Tellichery and Kalitha *et al.* (2011) in indigenous chicken of Assam. The shell color is a qualitative trait specific to the breed and variations in color are expected in the indigenous chicken since studied population was of non-descriptive type.

Table 1: Percentage of Egg shell color of indigenous chicken of Gulbarga Division

District	Egg shell color (%)		
	Creamy	Light brown	Brown
Bidar	17.27	38.28	44.45
Gulbarga	11.84	41.78	46.38
Koppala	15.86	35.86	48.28
Overall	14.99	38.64	46.37

2. Egg weight

The mean egg weights of indigenous chicken of Gulbarga Division are presented in Table 2. The average egg weight recorded from eggs collected from indigenous birds from scavenging system were 38.45±1.67 (Bidar), 37.68±1.33 (Gulbarga) and 40.38±1.27 g (Koppala). The overall average egg weight recorded was 38.83±1.37 g. The egg weight of Koppala district was significantly higher than eggs weight than of Bidar and Gulbarga districts. The average egg weight recorded was higher than the present study recorded in Aseel (Singh *et al.*, 2000), Vij *et al.* (2005) [24] in Danki and Kalasthi, Vijh *et al.* (2005a) [27] in Miri, Tantia *et al.* (2005a) [17] in Kashmir favorolla, Vijh *et al.* (2005b) [28] in Kalasthi, Badubi *et al.* (2006) [26] in Botswana indigenous, Parmar *et al.* (2006) [11] in Kadaknath, Tantia *et al.* (2006a) [18] in Ankleshwar, Vij *et al.* (2006b) [23] in Daothigiri, Vij *et al.* (2006c) in Danki and Kalasthi, Vijh *et al.* (2006) [26] in Nicobari fowl, Iqbal and Pampori (2008) [5] in indigenous Kashmir chicken, Kumar (2009) [13] in native birds of Kozhikode and Kannur districts of Kerala, Banerjee (2012) [2] in native fowl (Sikkim), Anitha *et al.* (2014) [1] in varieties of native birds, Vij *et al.* (2016) [25] in Kaunayen, Roy *et al.*

(2018) [13] in Haringhata Black, Sarma *et al.* (2018) [14] in Srinidhi, Vanaraja and Desi birds and Thangadurai and Shanmugam (2019) [20] in Gramapriya and TANUVAS Aseel birds. Lower egg weight was recorded by few of the authors like Tantia *et al.* (2006a) [18] in Ankleshwar, Vijh *et al.* (2007) in Red Jungle fowl, Vij *et al.* (2007) [22] in Busra, Mohanthy and Nayak (2011) [11] in local fowl of Orissa. Few authors recorded egg weight which was comparable with present study by Fayeye *et al.* (2005) [3] in Fulani, Vij *et al.*, (2006c) in Ghagus, Banerjee (2012) [2] in native fowl (West Bengal), Gopinath (2013) [4] in indigenous birds of Mysore division, Rajakumar (2013) [12] in indigenous birds of Bangalore division, Kumar *et al.* (2013) [9] in Tellicherry and Karuna *et al.*, (2017) [9] in Assel birds.

3. Shape index

The average egg shape indices of indigenous chicken of Gulbarga Division are presented in Table 2. The shape index recorded for eggs laid by indigenous chicken under scavenging system from different districts were 71.55±1.28 (Bidar), 70.01±1.26 (Gulbarga) and 72.48±1.17 (Koppala). The overall shape index recorded was 71.34±1.23. No significant difference was observed in egg shape indices among the three districts of Gulbarga division. Higher values of shape index than the present finding were recorded by Parmar *et al.* (2006) [11] in Kadaknath, Iqbal and Pampori (2008) [5] in Kashmiri, Singh *et al.* (2009) in local hills of Kashmir, Yadav *et al.*, (2009) [29]. In local fowl of UP, Gopinath (2013) [4] in indigenous chicken of Mysore division, Kumar *et al.* (2013) [9] in Tellicherry and Rajakumar (2013) [12] in indigenous chicken of Bangalore division of Karnataka. The shape index of present study is in agreement with the finding of Veeranna Gowda (2020b) [21] in indigenous birds of Belgaum division.

4. Shell weight (g)

The average egg shell weights of indigenous chicken of Gulbarga Division are presented in Table 2. The average egg shell weight recorded from scavenging system was 3.72±0.34 in Bidar, 3.63±0.18 in Gulbarga and 4.23±0.25 g in Koppala district. The overall shell weight recorded was 3.86±0.27 g. The shell weight of Koppala district was significantly higher than Bidar and Gulbarga districts. The egg shell weight of present study was comparable with egg shell weight recored by Vij *et al.* (2007) [22] in Bursa. The higher shell weight than the present study were reported by Fayeye *et al.* (2005) [3] in Fulani, Vij *et al.* (2005) [24] in Danki, Tantia *et al.* (2005a) [17] in Kashmir Favorolla, Vijh *et al.* (2005b) [28] in Kalasthi, Tantia *et al.* (2006a) [18] in Ankleshwar, Vij *et al.* (2006b) [23] in Daothigir, Vijh *et al.* (2006) [26] in Nicobari Brown, Iqbal and Pampori (2008) [5] in native chicken of Kashmir, Gopinath (2013) [4] in indigenous chicken of Mysore division, Kumar *et al.* (2013) [9] in Tellicherry and Vij *et al.* (2016) [25] in Kaunayen.

Table 2: Mean egg weight, shell weight and shape index of indigenous chicken of Gulbarga Division

District	N	Egg weight (g)	Shell weight (g)	Shape Index ^{NS}
Bidar	10	38.45±1.67 ^b	3.72±0.34 ^b	71.55±1.28
Gulbarga	10	37.68±1.33 ^b	3.63±0.18 ^b	70.01±1.26
Koppala	10	40.38±1.27 ^a	4.23±0.25 ^a	72.48±1.17
Overall	30	38.83±1.37	3.86±0.27	71.34±1.23

Mean±SE with different superscript differ significantly ($p<0.05$).

B. Internal egg quality traits

1. Albumen index

The average Albumin Index of indigenous chicken of Gulbarga division are presented in Table 3. The mean albumen index recorded from eggs of scavenging birds were 0.064 ± 0.013 in Bidar, 0.059 ± 0.004 in Gulbarga and 0.069 ± 0.009 in Koppala. The overall albumen index recorded was 0.064 ± 0.010 and there was no significant ($p < 0.05$) differences among three districts of Gulbarga division. The values of albumen index in present study was comparable with reports of Tantia *et al.* (2005a) [17] in Kashmir Favorolla, Tantia *et al.* (2005b) [19] in Ghagus, Vij *et al.* (2005) [24] in Danki, Vij *et al.* (2006b) [23] in Daothigir, Rajakumar (2013) [12] in indigenous birds of Bangalore division. Higher values of albumen index reported than the present study by Parmar *et al.* (2006) [11] in Kadaknath, Vijh *et al.* (2006) [26] in Nicobari fowl, Iqbal and Pampori (2008) [5] in indigenous chicken of Kashmiri and Vij *et al.* (2016) [25] in Kaunayen. The lower values of albumen index reported than the present study in Danki (Vij *et al.*, 2005) [24], Vijh *et al.* (2005a) [27] in Miri, Tantia *et al.* (2005b) [19] Ankleshwar, Vij *et al.*, (2006c) in Danki, Kalashti, Vij *et al.*, (2007) [22] in Busra and Gopinath (2013) [4] in indigenous chicken of Mysore division of Karnataka.

2. Yolk index

The average Yolk Index of indigenous chicken of Gulbarga Division are presented in Table 3. The average yolk index recorded from eggs of scavenging birds was 0.372 ± 0.0028 in Bidar, 0.357 ± 0.0031 in Gulbarga and 0.415 ± 0.0065 in Koppala district. The overall yolk index recorded was 0.381 ± 0.0045 and there was no significant ($p < 0.05$) difference among three districts of Gulbarga division. The values of yolk index documented in present study are in agreement with yolk index reported by Vijh *et al.* (2005a) [27] in Kalashti, Tantia *et al.* (2005b) [19] in Ghagus, Parmar *et al.* (2006) [11] in Kadaknath, Rajakumar (2013) [12] in indigenous chicken of Bangalore division of Karnataka and Vij *et al.* (2016) [25] in Kaunayen. The lower values of yolk index than the present study by Vij *et al.* (2005) [24] in Danki, Tantia *et al.* (2006a) [18] in Ankleshwar, Vijh *et al.* (2006) [26] in Danki and Kalashti, Vijh *et al.* (2006) [26] in Nicobari Black and Nicobari White, Vij *et al.* (2007) [22] in Busra and Gopinath (2013) [4] in indigenous chicken of Mysore division. Higher values of yolk index than the present study were reported by Vijh *et al.* (2005a) [27] in Miri, Tantia *et al.* (2005a) [17] in Kashmir Favorolla, Vij *et al.* (2006b) [23] in Ghagus and Iqbal and Pampori (2008) [5] in indigenous birds of Kashmir.

The Yolk quality is related to its color, appearance, texture, firmness and smell. The birds reared under backyard system get sufficient plant pigments, which will be deposited in the yolk. The yolk of eggs belonging to these three districts had dark color and pleasant smell.

3. Haugh unit score

The average Haugh Unit Score of indigenous chicken of Gulbarga Division are presented in Table 3. The average Haugh unit score observed from eggs of scavenging birds was 69.26 ± 1.23 in Bidar, 67.23 ± 1.17 in Gulbarga and 70.18 ± 1.29 in Koppala. The overall Haugh unit recorded was 68.89 ± 1.24 and there was no significant ($p < 0.05$) difference among three districts of Gulbarga division. The values of Haugh unit score recorded in present study are comparable with Haugh unit score reported by Vij *et al.* (2005) [24] in Danki, Tantia *et al.*

(2005a) [17] in Kashmir Favorolla, Vij *et al.* (2006c) in Kalashti, Vij *et al.* (2007) [22] in Tellichery and Gopinath (2013) [4] in indigenous chicken of Mysore division. The higher values of Haugh unit were reported by Fayeye *et al.* (2005) [3] in Fulani, Vijh *et al.* (2005a) [27] in Miri, Vijh *et al.* (2005b) [28] in Kalashti, Tantia *et al.* (2005b) [19] in Ghagus, Parmar *et al.* (2006) [11] in Kadaknath, Vij *et al.* (2006a) in Punjab brown, Tantia *et al.* (2006a) [18] in Ankleshwar, Vij *et al.* (2007) [22] in Busra, Iqbal and Pampori (2008) [5] in indigenous birds of Kashmir and Rajakumar (2013) [12] in indigenous chicken of Bangalore division of Karnataka. The lower values of Haugh unit score than the present study are reported by Kumar *et al.* (2013) [9] in Tellicherry.

Table 3: Internal egg qualities of indigenous chicken of Gulbarga Division

District	N	Albumen Index ^{NS}	H.U. ^{NS}	Yolk index ^{NS}
Bidar	10	0.064 ± 0.013	69.26 ± 1.23	0.372 ± 0.0028
Gulbarga	10	0.059 ± 0.004	67.23 ± 1.17	0.357 ± 0.0031
Koppala	10	0.069 ± 0.009	70.18 ± 1.29	0.415 ± 0.0065
Overall	30	0.064 ± 0.010	68.89 ± 1.24	0.381 ± 0.0045

Mean \pm SE with different superscript differ significantly ($p < 0.05$).

Conclusion

The external and internal egg quality traits of indigenous chicken of Gulbarga division reared under field conditions, the birds of Koppala district had better egg quality traits in terms of egg weight and shell weight, whereas the other parameters like albumen Index, yolk index, shape index and Haugh unit score showed no significant differences among the birds of three districts.

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