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Analysis of internal egg quality parameters of desi chickens in bidar district of Karnataka

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Abstract
Aim: Present study was conducted to assess the production performance and internal egg quality traits of Desi chickens in Bidar district of Karnataka.
Materials and Methods: A flock of 100 grower stage birds was obtained from the surrounding villages of Bidar district. These desi chickens were reared under intensive system in cage with standard managemental practices.
Results: The age at sexual maturity was 156.57±2.09 days and total egg production up to 52 week was represented as HHEP of desi bird was 59.31±11.49 eggs. The internal egg quality traits of desi chicken i.e. albumen index, albumen weight (g), albumen ratio (%), yolk index, yolk weight (g), yolk ratio (%), Haugh unit at 22nd week was 0.068±0.001, 12.87±0.14, 39.61±0.35, 0.445±0.006, 10.90±0.14, 33.56±0.38 and 69.54±0.68, at 34th week was 0.069±0.002, 16.10±0.22, 41.42±0.38, 0.431±0.006, 12.77±0.15, 32.84±0.20 and 68.46±0.65, at 42nd week was 0.073±0.002, 17.73±0.0.14, 43.01±0.24 0.426±0.007 13.37±0.15 32.43±0.34 and 70.01±0.64 and at 52nd week was 0.076±0.001, 20.10±0.21 g, 44.94±0.33%, 0.408±0.006, 14.00±0.15 g, 31.34±0.39 and 73.64±0.65 respectively.

Keywords: Bidar desi birds, internal quality, egg parameters, egg production

Introduction
The study of desi chickens especially the examination of the egg's internal quality is important since consumers prefer better quality eggs. Egg quality refers to the properties of an egg that influence its consumer acceptability (Kumar *et al.*, 2020) [14]. Egg quality parameters such as egg weight, yolk and albumen weight, genetic line and poultry age all influence embryo development (Onagbesan *et al.*, 2007) [18]. In addition, egg weight is an important phenotypic feature in chickens that determines egg quality and reproductive performance (Islam. 2001; Farooq *et al*., 2001) [9, 2]. The egg shell thickness is an important element in hatchability. The demand for desi birds also suggest that there is much more requirement of desi production and research has to be conducted for improvement of these birds, therefore the investigation was under taken to assess the egg production performance and internal egg quality of desi chicken in Bidar district of Karnataka under farm condition.

Materials and Methods
The present study was conducted on desi birds of Bidar district of Karnataka state. A flock of 100 birds of grower stage was procured from surrounding villages of Bidar district. Further, these birds were reared under cage system providing all feeding and managemental standards. Age at sexual maturity along with this daily egg production, internal quality of eggs was assessed during 22nd week, 34th week, 42nd week and 52nd week of age. The albumen height and yolk height was measured in (mm) of each egg was taken with the help of Spherometer and width of thick albumen and width of yolk (mm) was measured by Vernier caliper. Shape index, albumen index, yolk index and Haugh unit was determined by following standard procedures. The data obtained from the present study were analysed with one way ANOVA and the Tukey's multiple comparison post test for comparing means, using Graph Pad Prism version 5.0 statistical software.

Internal egg quality traits
Thirty fresh eggs were collected to assess Albumen index, yolk index, and Haugh unit, albumin weight and yolk weight.

Albumen weight (g): After separating the albumen from the yolk, the albumen weight was measured using a digital scale with an accuracy of 0.1 g.

Albumen Index: Digital Vernier caliper was used to determine the thick albumen largest length and widest width. Spherometer was used to measure the albumen height at three different places. The ratio of the average height and average width of the thick albumin of an egg was used to calculate albumen index.

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

Yolk weight(g): After removing the albumen from yolk, the weight of the yolk was measured with a digital scale that was accurate to 0.1 g.

Yolk index: Digital Vernier calipers were used to measure the yolk's diameter and yolk height was measured by using a Spherometer. The yolk index calculated is

$$\text{Yolk index} = \frac{\text{Height of the yolk (mm)}}{\text{Average Width of the yolk (mm)}}$$

Haugh unit (HU): The most widely used method of assessing albumin quality is by its Haugh Unit. The HU was calculated by using the following formula. HU = 100 log (H + 7.57 - 1.7 W0.37) Where, H = Height of dense albumin in mm. W = Weight of egg (g).

Albumen ratio (%): Albumen ratio is calculated by albumen weight divided by egg weight multiplying the result by 100. The Albumen weight and egg weight are given in grams.

$$\text{Albumen ratio} = \frac{\text{Albumen weight}}{\text{Egg weight}} \text{x} 100$$

Yolk ratio (%): The yolk weight and egg weight are given in grams; yolk ratio is calculated by yolk weight divided by egg weight multiplying the result by 100.

$$\text{Yolk ratio} = \frac{\text{Yolk weight}}{\text{Egg weight}} \text{x} 100$$

Results and Discussion

Albumen weight

The albumen weight at the 22nd, 34th, 42ndand 52ndweeks was 12.87±0.14,16.17±0.22, 17.73±0.0.14 and 20.10±0.21 g, respectively (Table 1). There were significant ($p \leq 0.05$) differences in albumen weights among each week under study. There was an increasing trend in egg weights with the increment in age. Similar pattern was reported by Rajkumar *et al*. (2009) [20] in Naked Neck Chicken, Mohanty and Nayak (2011) [17] in native chicken population of Bhubaneswar, Gopinath (2013) [17] in indigenous chickens of Mysore. The 34th week albumen weight was 16.10±0.22 g in desi chicken. In contrast, higher the albumen weight reported by Vij *et al*. (2005) [27] in Danki breed (24.43 g), Rajkumar *et al*. (2009) [20] in Naked Neck Chicken (34.73 g) and Islam and Datta (2010) [1] in indigenous chickens of Bangladesh (18.92±1.66 g).

The 42nd week albumen weight was 17.73±0.0.14 g in desi chicken, in contrast higher the alumen weight reported by Khatun *et al*. (2005) [10] in Naked Neck (24.49±0.66 g), Hilly (22.89±1.02 g) and Non-Descriptive (ND) desi birds (22.04±0.54 g), Khawaja *et al*. (2012) [11] in desi chickens (22±0.577 g) and Haunshi *et al*. (2015) [8] in Ghagus native breed (26.57±0.44 g).

The 52nd week albumen weight was 20.10±0.21 in desi chicken. The present albumen weight is lower than the albumen weight reported by Gopinath (2013) [17] in indigenous chickens of Mysore division (23.15±0.43 g), Padhi *et al*. (2013) [19] in Vanraja breed (37.84±0.83 g), Rajakumar (2013) [21] in indigenous chickens of Bangalore division (24.09±0.80g) and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division (22.87±0.14 g).

Albumen index

There were significant ($p \leq 0.05$) differences noticed between 22nd and 52nd week. Albumen index increases with the age advancement. As shown in (Table 1) The 22nd week albumen index was 0.068±0.001 in desi chicken of Bidar district results of the present study are in close agreement with the findings of Tantia *et al.* (2005) in Kashmir Favorolla. In contrast lower albumen index than present findings reported by Vij *et al*. (2006a) [28] In Danki, Kalasthi breed, Saravanan *et al*. (2020) [24] in Chirunkothu (*Gallus gallus*) chickens and Vidyasagar *et al*. (2022) [31] in desibirds.

The 34th week albumen index was 0.069±0.002 in desi chickens. Results of the present study are in close agreement with the findings of Vij *et al*. (2006a) [28] in Ghagus breeds.

The albumen index at 42nd week was 0.073±0.002 in desi chicken, results of the present study are in close agreement with the findings of Haunshi *et al*. (2009) [5] in Vanaraj breed (0.072±0.002), Haunshi *et al.* (2010) [6] in Kadaknath breed (0.072±0.002) and Gopinath (2013) [17] in indigenous chickens of Mysore division. In contrast higher albumen index reported by Haunshi *et al.* (2010) [6] in Aseel breed (0.076±0.00), Kalita *et al.* (2012) [32] indigenous chicken (0.09±0.01), Padhi *et al*. (2013) [19] in vanaraja breed and Rajakumar (2013) [21] in indigenous chickens of Bangalore division. Sudhir Naik (2021) [23] reported lower albumen index than present study in indigenous chickens of Gulbargadi vision and Vidyasagar *et al*. (2022) [31] in desi birds of Bidar district.

The albumen index at 52nd week was 0.076±0.001 in desi chicken. In contrast lower albumen index reported by Gopinath (2013) [17] in indigenous chickens of Mysore division, Sudhir Naik (2021) [23] in indigenous chickens of Gulbarga division. The same time higher album in index reported by Padhi *et al*. (2013) [19] in Vanraja breed, Rajakumar (2013) [21] in indigenous chickens of Bangalore division and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division.

Yolkweight

A significant ($p \leq 0.05$) difference observed in yolk weights among 22nd and 34th, 42nd, 52nd weeks of age. There was an increasing trend in yolk weights with the incrementin age (Table 1). Similar trend was reported by Rajkumar *et al*. (2009) [20] in Naked Neck Chicken. Gopinath (2013) [17], Rajakumar (2013) [21] and Veeranna Gowda (2020) [26] in digenous chickens.

The yolk weight of 22nd week was 10.90±0.14 g in desi chicken of Bidar district. There sults of the present study are in close agreement with Mohanty and Nayak (2011) [17] in native chicken population of Bhubaneswar (10.36±1.10g), Gopinath (2013) [17] in indigenous chickens of Mysore division and Rajakumar (2013) [21] in indigenous chickens of

Ramanagar district (10.95±0.09 g).
The yolk weight at 34th week was 12.77±0.15 g in desi chicken results of the present study are in agreement with Rajkumar *et al*. (2014) [22] in native Aseel chickens (12.95 g). The yolk weight at 42nd week was 13.37±0.15 g in desi chicken of Bidar district. The results of the present study are in proximity with Fayeye *et al*. (2005) [3] in Fulani-ecotype chickens (13.03±0.51 g), Rajakumar (2013) [21] in indigenous chickens of Rama Nagar district (13.44±0.17 g), Rajkumar *et al*. (2014) [22] in native Aseel chickens (13.30 g) and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaumdi vision in contrast, higher yolk weight reported than present findings by Rajkumar *et al*.(2009) [20] in Naked Neck Chicken (19.72 g), Haunshi *et al*. (2010) [6] in Aseel (16.32±0.24 g), Gopinath (2013) [17] indigenous chickens of Mysore division and Padhi *et al*. (2013) [19] in Vanraja breed.
The yolk weight of desi chicken at 52nd week was 14.00±0. 15 g. The results of the present study are in close agreement with Gopinath (2013) [17] in indigenous chickens of Chamaraj Nagar district (14.06±0.33 g) and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division. In contrast to present study lower yolk weight reported by Padhi *et al*. (2013) [17] in Vanraja breed (18.48±0.27 g) and Rajakumar (2013) [21] in indigenous chickens of Bangalore division (13.84±0.23 g). The higher yolk weight reported by Vij *et al*. (2005) [27] in Danki breed, Vijh *et al*. (2005) [30] in Miri breed and Gopinath (2013) [17] inindigenous chickens of Mysore and Mandya district (15.73±0.38 and 15.28±0.33 g) respectively.
The present study shows that the yolk weight of desi chicken increases with age advancement the yolk weight is directly proportional to the egg weight because the egg weight increases with age.

Yolk Index
There was significant ($p \leq 0.05$) difference in yolk index between 22nd and 52ndweek.In the present study decreasing trend observed in yolk index (Table 1). Similar pattern observed in Rajkumar *et al*. (2009) [20] in in Naked Neck Chicken, Gopinath (2013) [17] in indigenous chickens of Mysore division, Rajkumar *et al*. (2014) [22] in native Aseel chickens and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division.
The 22nd week yolk index was 0.445±0.006 in desi chicken the yolk index and present study is in agreement with Vidyasagar *et al*. (2022) [31] in desi birds (0.42±0.03).
The 34th week yolk index was 0.431±0.006 in desi chicken. Lower yolk index reported than present findings by Vidyasagar *et al*. (2022) [31] in desi birds (0.34±0.01).
The yolk index at 42nd week was 0.426±0.007 in desi chicken. Results of the present study are in agreement with Khatun *et al*. (2005) [10] in Hilly desi birds (0.42±0.005), Kumar *et al*. (2008) [12] in clean shank strains of local hill fowl (0.423±0.007). In contrast lower yolk index reported than present findings by Haunshi *et al*. (2009) [5] in Miri, Gramapriya and Vanaraj, Rajkumar *et al*. (2009) [20] in Naked Neck Chicken, Haunshi *et al*. (2010) [6] in Aseel and Kadaknath and, Gopinath (2013) [17] in indigenous chickens of Mysoredivision and Sudhir Naik (2021) [23] in indigenous chickens of Gulbargadi vision.
The yolk index of 52nd week was 0.408±0.006 in desi chickens, the result of present study is in agreement with Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division in Dharwad district (0.40±0.00). In contrast, lower yolk index reported by Gopinath (2013) [17] in indigenous chickens of Mysore division and Sudhir Naik (2021) [23] in indigenous chickens of Gulbarga division (0.3893±0.00), at the same time higher yolk index reported by Rajakumar (2013) [21] in indigenous chickens of Bangalore division (0.45±0.004).

Haugh unit
The mean Haugh unit of Desi chicken at 22nd, 34th, 42nd and 52nd week of age were 69.54±0.68, 68.46±0.65, 70.01±0.64 and 73.64±0.65 respectively (Table 1). There were significant ($p \leq 0.05$) differences in Haugh unit observed between 22ndand 52nd week.
The Haugh unit at 22nd week was 69.54±0.68 in desi chicken of Bidar district. The Haugh unit of the present study are in close proximity with Vij *et al*. (2007) [29] Tellicherry breed (69.07±3.48%), Gopinath (2013) [17] in indigenous chickens of Mysore division and Sudhir Naik (2021) [23] in in digenous chickens of Gulbarga division (69.42±0.19).

The Haugh
Unit at 42nd week was 70.01±0.64 in desi chicken in Bidar district and the result of the present study is in close agreement with Tantia *et al.* (2005) in Kashmir Favorolla (70.26±11.77%) and Sudhir Naik (2021) [23] in indigenous chickens of Gulbargadi vision. In contrast to lower Haugh unit reported than present findings by Haunshi *et al*. (2009) [5] in Miri, Gramapriya and Vanaraj birds (69.94±1.54, 69.10±1.41 and 67.41±2.71%) respectively and Gopinath (2013) [17] in indigenous chickens of Mysore division. The higher Haugh unit reported than present study by Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division.
The Haugh unit at 52nd week was 73.64±0.65 in desi chickens and the result of the present study are in close conformity with Rajkumar *et al*. (2014) [22] in native A seel chickens. In contrast lower Haugh unit reported than present study by Gopinath (2013) in indigenous chickens of Mysore division and Sudhir Naik (2021) [23] in indigenous chickens of Gulbarga division. In contrast higher haugh unit reported than present findings by Mohan *et al*. (2008b) [16] in Mohan *et al*. (2008b) [16] in Kadaknath breed (84.24±2.85%), Padhi *et al*. (2013) [19] in Vanaraja breed (87.50±1.67%), Rajakumar (2013) [21] in indigenous chickens of Bangalore vision and Veeranna Gowda (2020) [26] in indigenous chickens of Belgaum division. Means bearing the different superscripts within row indicate the significant difference ($p \leq 0.05$).

Albumin ratio
The mean albumen ratio at 22nd, 34th, 42nd and 52nd week of age were 39.61±0.35, 41.42±0.38, 43.01±0.24 and 44.94±0.33% respectively Table1. There were significant ($p \leq 0.05$) differences in albumen ratio among 22nd and 42nd, 52nd week there was an increasing trend in albumin ratio with the increment in age.
The albumen ratio at 42nd week was 43.01±0.24% in desi chicken. In contrast higher albumen ratio reported than present findings by Haunshi *et al.* (2010) [6] in Aseel and Kadaknath breed 56.88±0.43 and 59.31±0.33% respectively, Padhi *et al*. (2013) [19] in Vanaraja breed, Rajkumar *et al.* (2014) [22] in native Aseel chickens (54.43%) and Haunshi *et al*. (2015) [8] in Ghagus native breed (58.01±0.44%).
The albumen ratio at 52nd week was 44.94±0.33 in desi chickens. In contrast higher albumen ratio reported by Padhi *et al*. (2013) [19] in Vanaraja breed (61.18±0.59%), in Aseel

and Kadaknath breed and Saravanan *et al.* (2020) [24] in Chirunkothu chickens (52.14±0.14%).

Yolk ratio (%)

There was a significant ($p \leq 0.05$) difference between 22nd and 52nd week. The yolk ratio of present study shows the decreasing trend with increment with age (Table 1 and Fig. The similar tre and is reported by Padhi *et al*. (2013) [19] in vanaraja breed and Rajkumar *et al.* (2014) [22] in Aseel breed.

The 22nd week yolk ratio was 33.56±0.38% in desi chicken of Bidar district. The result of present study is close agreement with Iqbal *et al.* (2009) [33] in Kashmir Favorella (33.68%).

The 42nd week yolk ratio was 32.43±0.34% in desi chicken, the result are close agreement with Padhi *et al*. (2013) [19] in vanaraja. Rajkumar *et al.* (2014) [22] reported higher the yolk ratio than the present study in Aseel chickens and Haunshi *et al*. (2010) [6] in Aseel. Haunshi *et al*. (2010) [6] reported lower the shell ratio then the present study in Kadaknath.

The 52nd week yolk ratio was 31.34±0.39% in desi chicken, the yolk ratio of present study close proximity with Padhi *et al*. (2013) [19] in Vanaraj.

Table 1: Internal egg quality trait so indigenous chicken (n=30)

Egg parameters	**22week**	**34week**	**42week**	**52week**
Albumen width (mm)	52.43±0.62 ^{a}	55.78±0.66^{ab}	57.79±0.86 ^{b}	63.52±0.68 ^{c}
Albumen length (mm)	72.57±1.13 ^{a}	78.70±1.70 ^{ab}	84.08±1.44^{bc}	87.60±1.82 ^{c}
Albumen height (mm)	3.54±0.07 ^{a}	3.84±0.06^{ab}	4.16±0.08 ^{b}	4.80±0.07 ^{c}
Albumen weight (g)	12.87±0.14 ^{a}	16.17±0.22 ^{b}	17.73±0.14 ^{c}	20.10±0.21^{d}
Albumen index	0.068±0.001^{a}	0.069±0.002 ^{a}	0.073±0.002^{ab}	0.076±0.001^{b}
Yolk width (mm)	30.55±0.32 ^{a}	34.60±0.42 ^{b}	36.3±0.29 ^{b}	40.3±0.37 ^{c}
Yolk height (mm)	13.17±0.15 ^{a}	14.87±0.18 ^{b}	15.45±0.20^{bc}	16.46±0.27 ^{c}
Yolk weight (g)	10.90±0.14 ^{a}	12.77±0.15 ^{b}	13.37±0.15^{bc}	14.00±0.15 ^{c}
Yolk index	0.445±0.006 ^{b}	0.431±0.006^{ab}	0.426±0.007^{ab}	0.408±0.006 ^{a}
Haugh unit (%)	69.54±0.68 ^{a}	68.46±0.65 ^{a}	70.01±0.64 ^{a}	73.64±0.65 ^{b}
Albumen ratio (%)	39.61±0.35 ^{a}	41.42±0.38 ^{a}	43.01±0.24^{b}	44.94±0.33 ^{b}
Yolk ratio (%)	33.56±0.38 ^{a}	32.84±0.20^{ab}	32.43±0.34^{ab}	31.34±0.39 ^{b}

Means bearing the different superscripts within row indicate the significant difference ($p \leq 0.05$).

Conclusion

There was an increasing trend observed with the increment in age in albumen index, albumen weight, albumen ratio, yolk weight, Haugh unit and also there was a decreasing trend observed with the increment in age in yolk index, yolk ratio. Following conclusions can be drawn based on the findings of the present study. There is no recorded information on this native germplasm was accessible on quality attributes of Desi chicken in the Bidar area of Karnataka hence this attempt to define this valuable Bidar district germplasm for future recognition and improvement in breed performance.

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