



Morphological and certain economic traits under rural conditions of local ducks of Kashmir

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ABSTRACT

The present study was aimed at characterizing the local ducks of Kashmir Valley. The overall average adult body weight of the adult ducks was 1.70 ± 0.01 kg. The highest average body weight of 1.72 ± 0.01 kg was found in the ducks of district Bandipora and followed by 1.70 ± 0.02 kg and 1.69 ± 0.02 kg in ducks of Budgam and Ganderbal respectively. Males were heavier than females, with 1.62 ± 0.01 kg weight. Four types of bill colors, viz. greenish black (mosaic), pinkish black, yellow and greenish yellow mosaic, were observed. Yellow was predominant with frequency of about 74%. Four types of bean colors were observed viz. black, pink, white and yellow with preponderance of black (96%). There was equal distribution of grey and brown eye colors while as 99% shanks were orange colored and only 1% had orange with black patches on it. Egg analysis of 305 eggs from three districts revealed green and white shell colors. The overall weight of the eggs was recorded to be 66.20 ± 0.42 g with Ganderbal district having the highest egg weight of 69.19 ± 0.80 g and Budgam with the least of 62.10 ± 0.46 g. Haugh unit score was 69.37 ± 0.43 and the highest score was recorded in the eggs from Ganderbal district (70.58 ± 0.71).

Key words: Duck, Egg, Kashmir, Morphology, Traits

India has a population of 35 million ducks (FAO 2009), and state of West Bengal has the highest duck population. Mostly ducks are indigenous or non-descript types, which are hardy, with mediocre egg production and highly suitable for extensive system of rearing (Thangaraju 2009). *Desi* ducks are poor producer of meat and eggs compared to those of exotic breeds; survivability of indigenous ducks is higher than exotic ducks (Hamid *et al.* 1988). Indigenous ducks are well adapted to management and rural conditions of Kashmir and yield good quality meat. Exotic breeds of ducks are heavier and better layers than *desi* ducks, which are less acceptable to Kashmiri farmers due to the lower survivability. Local type ducks have special characteristics of tropical adaptability, better resistance to diseases and meat quality. Jammu and Kashmir has 5.59 lakh ducks (Directorate of Economics and Statistics Jammu and Kashmir 2008). Ducks adapt easily and rapidly to various adverse environmental conditions and are resistant to many common poultry diseases. They can be reared without extensive feeding system (supplemental feeding) and

require little labor for management. Till now no study has been carried out to characterize the local breeds of ducks in Kashmir vis-a-vis their production and prevalent farming system. The present study was designed to evaluate the growth performance of native breeds and their crosses with the exotic breeds for finding out the differences in growth performance among different genetic groups under tropical conditions.

MATERIALS AND METHODS

The present investigation was conducted in Budgam, Bandipora and Ganderbal districts of Valley. Each district was randomly divided in 5 zones. Adult ducks (651) of which 328 were male and 323 were female were studied for morphological attributes. The body weight of ducks was recorded by the author in person at the farmer's house; it was not always possible to get ducks of exact ages. So ducks above 6 months were considered adults and the body weight was recorded in kilograms. The adult birds were used for individual measurements of the shank length (from hock joint to base of toe) and bill length (from base of bill to tip of the bill) and recorded in cm. Color and pigmentation of bill and shank were also recorded. Eggs (305) were collected randomly from Budgam (104), Bandipora (100) and Ganderbal (101) for studying egg quality traits. The egg weight, shell thickness, shape index (Shultz 1953), albumin index (Heiman and Carver 1936), yolk index (Funk 1948),

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Table 1. Morphometry of local ducks in 3 districts of Kashmir valley

Parameters	Ganderbal	Budgam	Bandipora	Overall mean
Hatching weight (g)	33.58±0.02 ^a	32.65±0.01 ^a	34.40±0.01 ^a	33.54±0.01
Adult weight (kg)	1.70±0.02 ^a	1.69±0.02 ^a	1.72±0.01 ^a	1.70±0.01
Bill length (cm)	5.56±0.01 ^a	5.61±0.01 ^a	5.58±0.01 ^a	5.58±0.01
Shank length (cm)	5.38±0.01 ^a	5.30±0.01 ^a	5.53±0.01 ^b	5.43±0.01

Values with same superscript in a row do not vary significantly ($P>0.05$).

specific gravity of egg and albumen weight were estimated. The Haugh unit was calculated as per Haugh (1937).

The analysis of the data was done by using T-test, ANOVA and other non-parametric statistical tests.

RESULTS AND DISCUSSION

Morphometry: Various morphometrical parameters of the local ducks of the Kashmir Valley are summarized in Table 1. Overall hatchling weight and overall mean weight of adult birds showed no significant difference ($P>0.05$) between the districts. Banerjee (2013) also reported a significantly varying body weights within the various districts of West Bengal. Different workers reported varying weights of adult ducks. Ajith *et al.* (2009) reported the average adult weight of 1.63, 1.66, 1.69 and 1.7 kg in Chara female, Chemballi female, Chara male and Chembelli male, respectively. The variability of weights in different breeds, depend on the genetic make up of the breed and also the resources available to express the potential. Thus the variation among local Kashmir duck is attributed to its genetic potential and to the climate of the place. It was also observed that the ducks of district Bandipora are slightly better in weight (1.72 kg) than the ducks of other 2 districts which may be attributed to more natural feed resources available in the Wullar Lake.

Among the districts, significantly higher bill length was obtained in district Bandipora. The Bandipora Ducks are mostly seen in the Wullar Lake which is much deeper than other waterbodies of the Kashmir hence give selection advantage to the birds of longer bill length as this help them in feeding at the deeper depths, leading to exploitation of the deeper habitats (Euliss and Harris 1987).

No variation was obtained within districts with respect to shank length as against the observation of Dinesh *et al.* (2008) who observed a difference in 5 provinces of the Cambodian ducks.

Effect of sex on morphometry: The significant variation in the adult body weight, bill length and shank length among the sexes is quite evident from the data (Table 2). Males were significantly heavier than the female counterparts, as also reported by Dinesh *et al.* (2008), Islam *et al.* (2009), Yakubu (2009) and Banerjee (2013). Since the differentiation of sex on morphological basis is done at about 3 months of age, the ducklings were weighed without the consideration of sex.

Sexual dimorphism was observed in the other traits as well. Females have higher value of shank length and bill length (Table 2). Ajith *et al.* (2009) reported the bill length

of 6.10, 6.30, 6.70 and 6.80 cm in Chara and Chemballi females and their males of Kerala, respectively. Observations of male dominance are by Raji *et al.* (2009), Mccracken *et al.* (2000), Yakubu (2009) and Murugan *et al.* (2009) while studying the morphometric traits of different breeds of ducks. Dinesh *et al.* (2008) observed higher shank length in males (5.7 cm) than females (5.3 cm) while characterizing the local ducks of Kampot province of Cambodia. Similarly Ajith *et al.* (2009) and Murugan *et al.* (2009) made similar observations. The higher values of shank length and bill length in females may be because of the founding effect wherein the founding population had this morphometry and this became evident in the subsequent generations.

Gross morphological characters: The frequencies of various morphological characteristics are summarized in Table 3. The predominant bill color was yellow which was followed by greenish black and pinkish black. Dinesh *et al.* (2008) reported a range of colors from black to yellow-green in Cambodian ducks, wherein yellow predominated

Table 2. Effect of sex on morphometry of local ducks of Kashmir valley

Parameters	Male (N=328)	Female (N=323)	Overall mean (N=651)
Adult weight (kg)	1.79±0.14 ^b	1.62±0.01 ^a	1.70±0.01
Bill length (cm)	5.51±0.01 ^a	5.66±0.01 ^b	5.58±0.01
Shank length (cm)	5.33±0.01 ^a	5.51±0.01 ^b	5.43±0.01

Values with same superscript in a row do not vary significantly ($P>0.05$).

Table 3. Morphological characters of local ducks of Kashmir valley

Parameters	Types	Frequency	%
Bill color	Greenish black (mosaic)	147	22.6
	Pinkish black	5	0.8
	Yellow	487	74.8
	Greenish yellow mosaic	12	1.8
Bean color	Black	627	96.3
	Pink	4	0.6
	White	17	2.6
	Yellow	3	0.5
Eye color	Brown	349	53.6
	Grey	302	46.4
Shank color	Orange	647	99.4
	Orange with Black patches	4	0.7

in 2 provinces while as black was observed to be the highest in 3 provinces. Similarly, Murugan *et al.* (2009) observed only dark orange bill in Kreeri and orange in Sanyasi variety of ducks of Tamil Nadu. Likewise, the bill colour was slate grey and uniform in the Pati ducks (Banerjee 2013).

Bean color was predominantly black followed by white and then yellow in the present study. Dinesh *et al.* (2008) observed four different bean colors in the Cambodian ducks viz. black, dark, white and yellow. Black dominated in all the provinces of the region showing similarity with the current observation.

Brown and grey eye color were found almost in equal proportions in the local ducks of Kashmir. However, black, blue, brown, grey-brown and yellow were observed by Dinesh *et al.* (2008). The percentage of brown in their study ranged from 57 to 74% and thus dominating the eye color of ducks.

Similarly, in the present study, orange dominated as the shank color of ducks with a percentage of 99.4% and a meager 0.7% of ducks showed orange with black patches on shank. Sanyasi and Kreeri variety of local ducks of Tamil Nadu had dark orange and orange shanks respectively (Murugan *et al.* 2009) whereas Dinesh *et al.* (2008) observed 6 different color shanks in Cambodian ducks in which yellow dominated in 2 of the 5 provinces.

Male specific curved feather was observed at the back which is absent in females as was also reported by Banerjee (2013).

External egg quality traits

Shell color: Two types of shell colors viz. white and green were observed in the present study. Avian egg color was explained as mainly serving crypsis or mimetism, although the function of certain colors (e.g. blue and green) has not yet been demonstrated. Moreno and Osorno (2003) interpreted egg color as a sexually selected signal of the laying female's genetic quality to its mate to induce a higher allocation of paternal care. The pigment responsible for the blue-green color is biliverdin, a substance produced when the hemoglobin of damaged red blood cells is catabolized and also known to have strong antioxidant properties.

Antioxidants are important because they can convert free radicals, molecules that can damage DNA, proteins, and other macromolecules, into less reactive substances. Deposition of this pigment in eggshells by laying females may, therefore, signal their capacity to produce antioxidants and control free radicals. Male birds paired to females of such quality that they are able to deposit antioxidants in eggshells rather than retaining them may then expend greater effort in caring for their superior offspring (Kilner 2006).

Egg weight: In the present study, the average egg weight was 66.20 ± 0.42 g. Harimurti *et al.* (2009) have observed 70.66 g as average egg weight in unconfined ducks of Indonesia. Similarly, Kalita *et al.* (2004) recorded average weight of 52.09 g for eggs of local ducks of Asom while Niranjana and Datt (2009) have recorded 52.67 g as average egg weight of local ducks of Tripura and a similar gross weight of 53.50 ± 5.76 g was reported by Kabir *et al.* (2012). However Islam *et al.* (2009) reported average egg weight of 74.69 g for Cina hanh ducks of Asom. In the present study, egg weight was significantly lower in Budgam district than the other 2 districts (Table 4). Very few waterbodies are found in Budgam district, which is one of the limiting factors for food availability to the ducks, and that may be the prime reason for lesser egg weight.

Shape index: The overall value of shape index of eggs obtained was 67.85 ± 0.01 with district Budgam showing significantly lower values (Table 4). Shape index of 73.03 was recorded by Kalita *et al.* (2004) in the *desi* ducks of Asom and 74.16 by Niranjana and Datt (2009) in the local ducks of Tripura. The shape index in present study was comparatively lower than reports available in literature.

Internal egg quality traits

Yolk color: While studying the internal egg quality, 2 yolk colors were observed, viz. yellow and orange. Egg yolk in birds is colored yellowish-red by carotenoids. Protection against lipid peroxidation in young birds is afforded by the actions of yolk-derived carotenoids and other antioxidants, like vitamin E. Antioxidants also protect passively-acquired antibodies against breakdown. Thus,

Table 4. Egg quality analysis of local Kashmir duck eggs

Parameters	Ganderbal (N =101)	Budgam (N = 104)	Bandipora (N =100)	Overall mean (N = 305)
Egg weight (g)	69.19 ± 0.80^b	62.10 ± 0.46^a	67.44 ± 0.70^b	66.20 ± 0.42
Shape index	68.55 ± 0.01^b	66.78 ± 0.01^a	68.27 ± 0.01^b	67.85 ± 0.01
Specific gravity	1.10 ± 0.01^a	1.10 ± 0.01^a	1.04 ± 0.01^a	1.07 ± 0.01
Yolk index	0.42 ± 0.01^a	0.45 ± 0.01^b	0.46 ± 0.01^b	0.44 ± 0.01
Yolk weight (g)	23.70 ± 0.33^a	24.10 ± 0.23^a	23.81 ± 0.15^a	23.90 ± 0.14
Albumin weight (g)	36.90 ± 0.50^c	30.13 ± 0.40^a	35.06 ± 0.63^b	34.00 ± 0.34
Albumin index	0.72 ± 0.01^a	0.70 ± 0.01^a	0.07 ± 0.01^a	0.07 ± 0.01
Shell weight (g)	8.60 ± 0.11^b	7.86 ± 0.10^a	8.57 ± 0.99^b	8.34 ± 0.06
Shell thickness (mm)	35 ± 0.01^b	33 ± 0.01^a	34 ± 0.01^a	34 ± 0.01
Haugh unit	70.58 ± 0.71^b	67.80 ± 0.64^a	69.76 ± 0.86^{ab}	69.37 ± 0.43

Values with same superscript in a row do not vary significantly ($P > 0.05$).

maternal investment in egg composition, including carotenoids, might have a greater influence on offspring viability than was realized. The use of carotenoid pigments in the sexual displays of female birds might indicate their ability to produce high quality eggs and chicks (Blount *et al.* 2000).

Yolk index: Significantly lower yolk index was recorded in the eggs from Ganderbal district (Table 4). However, the overall mean value of 0.44 ± 0.01 was obtained for the yolk index of duck eggs of Kashmir. Shamsudeen *et al.* (2009), and Niranjana and Datt (2009) observed almost similar yolk index of 0.42 in ducks of Namakkal district of Tamil Nadu and Tripura, respectively, while Padhi *et al.* (2009) recorded the mean value of 0.34 for the eggs *desi* ducks of Odisha.

Yolk weight: The average yolk weight recorded in the present study was 23.90 ± 0.14 g with no significant difference among the 3 districts under the present study (Table 4). Sangilimandan (2009) recorded average yolk weight of 23.22 g in the market duck eggs of Chennai. Mahanta *et al.* (2009) recorded the yolk weight of 25.14 g in the Chara-Chemballi ducks of Asom whereas it was recorded to be 24.98 g by Harimurti *et al.* (2009) in the eggs laid under laguna system (un-confined) of housing in Indonesia.

Albumen index: The average albumen index recorded in the present study was 0.07 ± 0.01 which is slightly lower to the values reported by Mahanta *et al.* (2009), Sangilimandan *et al.* (2009) and Niranjana and Datt (2009) as 0.11, 0.09 and 0.20 respectively. Again no significance was seen in the values of the 3 districts under study (Table 4).

Albumen weight: The albumen weight of the eggs showed a significant variation between all the 3 districts (Table 4). Harimurti *et al.* (2009) recorded average albumen weight as 37.43 g while Mahanta *et al.* (2009) and Sangilimandan *et al.* (2009) recorded albumen weights as 35.03 g and 31.08 g respectively.

Shell weight: The overall mean of shell weight recorded was 8.34 ± 0.06 g. Lower values than being reported herein were obtained by Harimurti *et al.* (2009) in laguna (non-confinement) raised ducks (8.18 g) as well in confined raised ducks (Mojosari and Brebes/5.82 and 7.31 g respectively). Similar lower values were recorded by Sangilimandan *et al.* (2009) and Shamsudeen *et al.* (2009) also while as higher values than these were recorded by Mahanta *et al.* (2009) in Chara-Chemballi ducks in Asom. Significantly lower values were seen for the eggs obtained from the district of Budgam in the present study (Table 4). Lower weight of egg shells have been reported to contribute to lower hatchability (Yuan 2013).

Shell thickness: The average shell thickness recorded was 34 mm. However, Kalita *et al.* (2004) and Niranjana and Datt (2009) had observed shell thickness of 28 mm and 29 mm respectively. Shamsudeen *et al.* (2009) observed higher value of it (39 mm) in the duck eggs of Chennai. Shell thickness is significantly higher in duck eggs of district Ganderbal (Table 4) giving them better chances of carriage through market without getting broken.

Haugh unit: The overall average of Haugh unit was 69.37 with significantly higher Haugh unit score for duck eggs of Ganderbal and Bandipora districts, Ganderbal eggs having slightly better score over Bandipora eggs (Table 4). Kalita *et al.* (2004) recorded Haugh unit of 82.15 in *Desi* ducks eggs of Asom while Harimurti *et al.* (2009) recorded Haugh unit of 83.18 in the laguna raised birds in Indonesia. Similarly Niranjana and Datt (2009) recorded Haugh unit of eggs of local ducks of Tripura as 86.73. Shamsudeen *et al.* (2009) recorded Haugh unit of 82.85 for duck eggs of Chennai. The lower Haugh unit may be due to lower albumen height of the duck eggs and the low storage temperature. Since the study was carried during winter, the lower temperature has affected the Haugh unit of the eggs. This decrease of Haugh unit due to decrease in temperature was also reported by Samli *et al.* (2005).

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