



Morphometric characterization of local geese in the Valley of Kashmir

HENNA HAMADANI¹, A A KHAN², M S MIR³, M T BANDAY⁴, T A S GANAI⁵ and A HAMADANI⁶

*Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar,
Jammu and Kashmir 190006 India*

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ABSTRACT

An extensive study was carried out in the geese rearing areas of Kashmir Valley to record the morphometric parameters which included external body measurements and visceral measurements of local geese. Among the external body measurements, body weight, bill dimensions, knob diameter, neck dimensions, length from tip of bill to tail tip and wing span was significantly more in males than females. Among the visceral measurements, only jejunum length showed a significant difference between the sexes. In females, the mean oviduct length was 38.5 ± 8.5 cm and the mean weight of ovaries was 12.51 ± 2.225 g. In males, left testicle was found significantly larger than the right one in terms of length and breadth but the weight of left and right testicle did not vary significantly.

Key words: Body measurements, Body weight, Ovary size, Testicle size, Visceral measurements

At present goose farming is economically important only in Asia and Central Europe. Besides supplying nutritious meat, huge eggs and rich fat for cooking; they also provide soft down and feathers for bedding and clothing, which makes them particularly appropriate for providing farmers with a supplementary income and much needed animal protein for family. However, domestic geese have remained a neglected species in many countries including India to the extent that not even basic statistics are available. Perusal of literature revealed that only meagre scientific studies have been carried out on geese across the world and the situation is more dismal as far as India is concerned. In order to generate a baseline data on available geese germplasm, a study was planned to document the morphometric characteristics of domestic geese of Kashmir.

MATERIALS AND METHODS

The study was conducted in Srinagar, Ganderbal and Bandipora districts of the Kashmir valley. The geese rearing areas in these districts were identified and during the survey, external morphometry of 746 adult geese and internal morphometry (visceral measurements) of 30 adult geese was carried out.

External morphometry: Various measurements which were recorded on the 746 individual birds included the adult body weight (kg), dimensions of bill - length (cm) and width (cm), knob diameter (cm), head girth (cm), dimensions of

neck - length (cm) and girth (cm), chest girth (cm), breast angle (degree), keel length (cm), length from tip of the beak to tip of the tail (cm), length across wings (cm) and shank length (cm).

Visceral measurements: Various measurements of viscera were taken in terms of length of different parts of intestine (duodenum, jejunum, ileum, caeca and colon), oesophagus, trachea and oviduct. Dimensions (length and breadth) of proventriculus and testicles were also taken. Besides the weight of gizzard, spleen, liver, heart, testicles and ovaries was also recorded.

Data analysis: The data were tabulated, classified and analyzed by drawing averages and the means between the groups were compared by using Student's t-test (Snedecor and Cochran 1980) using a statistical software SPSS 15.0.

RESULTS AND DISCUSSION

External morphometry

Body weight: In the present study males weighed significantly more than female geese (Table 1). Salahuddin *et al.* (2006) also reported similar body weights in domestic geese of Kashmir. Males in general weighed more than that of females in other breeds of geese also. Body weight was in similar range as that of the present in some goose breeds like Co, Daoxian, Garbonosa, Hwo, Local geese of Kural and Massakory, Local geese of Mandelia, Taihu, Wugang (Buckland and Guy 2002) and local geese of West Bengal (Banerjee 2013).

Lesser body weight was reported in the Phillipine domestic geese, Rung Eu geese and Wuzhong geese but was higher than that in breeds Alder, African, Blanche de Bourbonnais, Buff, Diepholzer, Embden, Gorki, Kaluga,

Present address: ^{1,2,4}(endolf123@gmail.com), Division of Livestock Production and Management, SKUAST-Kashmir, ³Division of Veterinary Pathology; ⁵Division of Animal Genetics and Breeding, ⁶F.V.Sc & A.H, SKUAST-Kashmir.

Lionhead, Pomeranian, Roman, Shitou and Skanegas (Buckland and Guy 2002).

The body weight of adult domestic geese of Kashmir was higher, than that of domestic duck of Kashmir (Salahuddin *et al.* 2006, Bihaqi 2012) in their respective studies, and indigenous chicken of Kashmir (Salahuddin *et al.* 2000). The wild migratory goose visiting the valley during migratory season to weighed 3.175 kg (Lawrence 1895).

Dimensions of a bill - length and width: The bill length was significantly more in males than females in the present study (Table 1), which is in agreement with the studies on Vishtines geese (Jackunas 1957), Turkish geese (Saatci and Tilki 2007) and Cotton Pygmy-goose (Upadhyaya and Saikia 2011). Similarly, bill width in the studied geese was more in males than that in females (Table 1), as also reported in Turkish geese (Saatci and Tilki 2007) and Cotton Pygmy-goose (Upadhyaya and Saikia 2011).

Knob diameter: Significant difference was found between the sexes, with greater knob diameter in males than that in females (Table 1). Our results are supported by the findings of Buckland and Guy (2002) who have also mentioned a larger knob to be present in males.

Head width: No statistically significant difference was found in the head width between the sexes of adult birds but numerically it was higher in males as compared to that of females (Table 1). Higher head width was also reported in males than females in Turkish geese (Saatci and Tilki 2007). However, Upadhyaya and Saikia (2011) reported a higher circumference of head in males of wild Cotton Pygmy-goose during the monsoon.

Dimensions of neck – length and girth: Ganders had significantly longer neck than the females in the present study, as was also reported by others (Jackunas 1957, Saatci and Tilki 2007, Upadhyaya and Saikia 2011). The neck girth of males in the present study was more in comparison to the females (Table 1). This is in agreement with the reports of others (Jackunas 1957, Upadhyaya and Saikia 2011).

Chest girth: Chest girth in Vishtines geese (55.50 ± 0.55

cm in male and 51.30 ± 0.28 cm in female) and White Kouda geese (47.3 ± 2.1 cm in male and 45.7 ± 1.8 cm in female), as reported by Jackunas (1957) and Lukaszewicz *et al.* (2011) respectively, was almost in the same range as that in the present study (Table 1).

Breast angle: Overall breast angle in the observed geese was 42.977 ± 0.568 degree (Table 1). No reports could be found about the breast angle measurements in geese. However, varied range of breast angle is reported in chicken (Francesch *et al.* 2011) which may be attributed to breed difference, genetic make-up and species variation.

Keel length: Keel length of 19.1 ± 0.8 cm (male) and 17.8 ± 0.7 cm (female) in White Kouda geese (Lukaszewicz *et al.* 2011) and 21.20 ± 0.22 cm (male) and 18.74 ± 0.11 cm (female) in Vishtines geese (Jackunas 1957) was reported, which was slightly higher than the keel length of observed geese (Table 1). This variation may also be attributed to the genetic make-up and breed difference.

Length from tip of the beak to tip of the tail: Length from tip of the beak to tip of the tail was significantly more in males than in females (Table 1) and the results are in harmony with those of Saatci and Tilki (2007).

Length across wings: Males showed significantly more length across the wings than that of females in the present study (Table 1) and similar findings were reported in Turkish geese (Saatci and Tilki 2007).

Shank length: The overall shank length (Table 1) was more than the White Kouda geese (Lukaszewicz *et al.* 2011) where it was only 8.2 ± 0.4 cm. The variation may be attributed to the genetic make-up and breed difference. However, the shank length in the observed geese (11.865 ± 2.006 in male and 11.249 ± 1.925 cm in female) was almost in same range (11.10 ± 0.18 in male and 9.58 ± 0.07 cm in female) as that of the Vishtines geese (Jackunas 1957).

Visceral measurements: The measurements of various viscera are depicted in the Tables 2 and 3. The length of duodenum, jejunum + ileum, caecum, colon + cloaca of the Kashmir geese was lesser in the present study than in

Table 1. External morphometric characteristics

Parameter	Male	Female	Overall mean
Body weight (kg)	3.816 ± 0.103^b	3.342 ± 0.071^a	3.564 ± 0.067
Bill length (cm)	9.361 ± 0.136^b	8.470 ± 0.100^a	8.888 ± 0.970
Bill width (cm)	2.725 ± 0.036^b	2.593 ± 0.029^a	2.656 ± 0.024
Knob diameter (cm)	2.691 ± 0.094^b	2.183 ± 0.078^a	2.400 ± 0.073
Head width (cm)	4.000 ± 0.000	3.970 ± 0.042	3.976 ± 0.035
Neck length (cm)	31.540 ± 0.524^b	29.767 ± 0.486^a	30.599 ± 0.368
Neck girth (cm)	10.500 ± 0.156^b	9.807 ± 0.091^a	10.135 ± 0.099
Chest girth (cm)	41.921 ± 0.782	39.931 ± 0.676	40.865 ± 0.522
Breast angle (°)	43.897 ± 0.911	42.163 ± 0.691	42.977 ± 0.568
Keel length (cm)	15.776 ± 0.370	15.130 ± 0.201	15.433 ± 0.206
Length from tip of beak to tip of tail (cm)	88.662 ± 1.069^b	84.869 ± 0.833^a	86.646 ± 0.698
Length across wings (cm)	138.069 ± 1.971^b	131.956 ± 1.742^a	134.742 ± 1.343
Shank length (cm)	11.865 ± 2.006	11.249 ± 1.925	11.538 ± 1.381

Male and female means bearing different superscripts in a row differ significantly ($P < 0.05$).

Table 2. Measurements of visceral organs in domestic geese

Parameter	Male	Female	Overall mean
Duodenum length (cm)	32.875±2.17	34.778±0.602	34.283±0.925
Jejunum length (cm)	69.751±5.116 ^a	80.30±1.972 ^b	79.444±1.888
Ileum length (cm)	73.549±6.134	78.6±1.714	79.118±1.816
Caecum length (cm)	19.625±0.533	19.0±0.592	20.833±0.583
Colon + cloaca length (cm)	12.8±0.846	12.3±0.559	15.761±3.625
Oesophagus length (cm)	32.5±1.443	32.875±0.789	32.8±0.728
Proventriculus length (cm)	4.25±0.144	4.944±0.294	4.818±0.255
Proventriculus breadth (cm)	3.25±0.144	3.556±0.13	3.5±0.117
Trachea length (cm)	24.0±0.0	25.0±1.022	24.909±0.929
Gizzard weight (g)	87.50±4.27	80.67±1.49	94.08±3.32
Spleen weight (g)	1.9±0.1	1.68±0.109	1.763±0.079
Liver weight (g)	56.33±0.91	53.89±0.78	55.18±1.49
Heart weight (g)	27.15±1.41	25.38±0.75	25.29±0.53
Oviduct length (cm)	-	38.5±8.50	38.5±8.50
Ovary weight (g)	-	12.51±2.225	12.51±2.225

Male and female means bearing different superscripts in a row differ significantly ($P<0.05$).

the Bean goose where these lengths were 42.4±44, 219±154, 25.9±40, 16.9±14 cm respectively (Szczepanczyk *et al.* 2000). The length of oesophagus in the observed geese was however more than in the Bean goose and domestic goose from Basrah city where it was 29.8±26 cm (Szczepanczyk *et al.* 2000) and 27.53 cm (Shehan 2012) respectively. Kashmir geese had lesser jejunum length but higher ileum, caecum, colorectum, oesophagus and proventriculus length and almost equivalent duodenum length in comparison to the broiler chicken of 28 days where the length of jejunum, ileum, caecum, colorectum, oesophagus, proventriculus and duodenum was 123.50±3.663, 31±3.663, 18.125±1.732, 8.83±0.037, 13.75±0.478, 3.70±0.122 and 34.13±1.477 cm respectively (Nasrin *et al.* 2012). No reports are available about the proventricular breadth in any of the poultry species except in Japanese quail where it was reported to be 1.5±0.2 cm (Ahmed *et al.* 2011), which is obviously less than the proventricular breadth in geese because of marked difference in body size of the 2 species. Santos *et al.* (2008) also reported a statistically nonsignificant difference between the trachea length among sexes of domestic geese, as was found in the present study. Total trachea length (33±2.7 cm) in domestic geese as reported by Santos *et al.* (2008) was, however, more than the overall length of trachea in the present study. The variation in the oesophageal and tracheal length is likely to be related to the neck length of the geese. Quiet obviously the species having longer necks are expected to have comparably longer oesophagus and trachea. These variations could again be attributed to breed difference, genetic make-up and species variation.

Oviduct length in the studied goose was lesser in comparison to the chicken where it is reported to be of 60–70 cm length (Blendea *et al.* 2012). The weight of ovary in the observed goose at the time of slaughter was 12.51±8.5 g. The weight of ovary and the length of oviduct is highly variable not only because of the breed difference, genetic

Table 3. Measurements of testicles of domestic geese

Parameter	Left testicle	Right testicle
Length (cm)	2.225±0.020 ^b	1.855±0.084 ^a
Breadth (cm)	1.618±0.052 ^b	1.353±0.062 ^a
Weight (g)	5.361±0.603	4.789±0.638

Means bearing different superscripts in a row differ significantly ($P<0.05$).

make-up, species variation and age but also because of the season of laying. Higher ovary weight in the present study as compared to that of ISA Brown chicken at 12 weeks (0.48±0.010 g) and 18 weeks (0.71±0.010 g) was clear manifestation of the species difference but the same chicken at 36 weeks of age had an ovarian weight of 41.89±0.716 g, which was a result of larger number of developing follicles in the ovary of this high producing poultry breed. The smaller ovarian weight in the geese observed in the present study could be corroborated with the low egg production potential of the geese. Rahman *et al.* (1999) in their study on chicken have also attributed high volume of egg production in ISA Brown chicken to the larger size of ovary and oviduct.

In the observed ganders, left testicle was significantly larger than the right one in terms of length and breadth. A common situation in avian taxa is that the testis on one side, often the left, develops to be larger than the other (Briskie and Montgomerie 2007).

The weight of gizzard and liver was lower in the observed geese than that of the Vishtines geese where it was 192.90±22.29 and 91.40±7.07 g respectively (Jackunas 1957). Heart weight was almost in the same range as of the Vishtines geese and native geese of Iraq where it was 25.83±1.72 g (Jackunas 1957) and 24.72±4.3 g (Ismael 2011) respectively. Liver + spleen weight was higher in the present study in comparison to native geese of Iraq, where

the combined weight was 47.77 ± 6.14 g (Ismael 2011). Spleen weight in the observed geese was lower than the native geese reared in Mus province of Turkey where the weight is 2.28 g for males 2.18 g for females (C'elik and Bozkurt 2009). The weight of heart, liver and gizzard in domestic geese of Kashmir was higher than that of domestic duck (Salahuddin *et al.* 2006, Bihaqi 2012) and desi chicken (Salahuddin *et al.* 2000) of Kashmir.

The study characterized the domestic Kashmir geese on the basis of morphometry which shall aid in its breed registration as well as serve as the baseline work for the future research.

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