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Gross anatomical studies on the thyroid gland of chabro chicken reared in summer and winter seasons

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Abstract

Gross anatomical studies were conducted on the thyroid gland of eight weeks old 24 apparently healthy Chabro chickens procured from Poultry Farm, Mathura (India). The chickens were divided into two groups (12 chickens in each group) and reared in summer and winter season. The thyroid gland of chabro chicken was light pink, oval bodies i.e. right and left thyroid located on the ventral surface of the base of the neck just caudal to the junction of subclavian and common carotid arteries. There was 1.8 and three times increase in carcass weight of chicken and weight of thyroid gland, respectively from summer to winter season. The left thyroid gland was situated more cranially than the right thyroid. The average weight of thyroid and all biometrical parameters viz. length, width and thickness were more in winter season reared chickens.

Keywords: Thyroid gland, Chabro chicken, biometry, seasons

Introduction

Endocrine system plays an important role in proper development and differentiation of organ systems. It plays an important role in controlling pre and post natal growth and differentiation of many organ systems. Chabro chicken is a breed developed by Central Poultry Development Organization (CPDO) for enhancing the backyard poultry farming. It is more adoptive to climatic fluctuations and acclimatizes to the entire climatic zone. Gross anatomical changes of the gland in association with seasonal changes has not been studied so far in chicken, especially in Chabro. The present study describes the season related variations in anatomy of thyroid gland in Chabro. The study was conducted on thyroid gland because it controls the basal metabolic rate, differentiation and development of the central nervous system, development and growth of muscles and bones, control of reproduction and integumentary development including feathering. Secretion of TSH and T4 of thyroid gland play an important role in maintenance of body temperature in hot and cold seasons in fowl [6]. Thyroid hormones in birds regulate body weight, plumage growth, fertility, secondary sex characteristics and lipid metabolism [8]. Hence, the present study is designed to record and compare differences in seasonal behavior in thyroid gland anatomy in Chabro.

Materials and Methods

The present study was conducted in 2018 on thyroid gland of eight weeks old 24 apparently healthy Chabro chickens procured from poultry farm of Veterinary College, Mathura after getting ethical permission from CPCSEA. The birds were divided into two groups of 12 chickens in each group reared in summer and winter season. In summer, the average temperature of poultry house in morning and evening was 34.34 and 35.31 °C, respectively. In winter, the average temperature of poultry house in morning and evening was 24.43 and 35.31 °C, respectively. For biometrical study, the chickens were sacrificed and their thoracic cavity exposed by making a ventro- median incision. The muscles of thoracic region and air sac of the clavicle were reflected. The shape, colour, location and relative topographic in-situ position of thyroid glands were recorded. The thyroid glands were then harvested out of thoracic cavity and the weight of both (right and left) thyroid gland measured through electrical weighing balance. The length, width and thickness were recorded by using non-stretchable thread and digital Vernier callipers. The data was subjected to statistical analysis [12] with the help of SPSS 20.0 software.

Results and Discussion

The thyroid gland of chabro chicken was paired organ i.e. right and left thyroid were located on the ventral surface of the base of neck just caudal to the junction of subclavian and common carotid arteries as reported earlier in Kuttanad ducks [4], Pati ducks [10,11, 12] and Iraqi turkey [1].

Both left and right thyroid glands were placed asymmetrically with regard to each other (Fig. 1). However, Ali and Mirhish (2015) [1] in Iraqi turkey observed symmetrically located right and left thyroid. The left thyroid gland was placed more cranially than the right one both in summer and winter season reared chabro chicken. The cranial position of left thyroid gland might be due to location of heart at this side. This finding was akin with the finding of Breit *et al.* (1998) [2] in chicken. However, Teresa and Tomasz (2004) [13] in budgerigar reported that the right thyroid gland was placed more cranially than the left one. In summer season, the left and right thyroid glands were located at 11th to 12th and 13th to 14th cervical vertebrae, respectively. While, the chickens reared in winter season, the left thyroid gland was placed at 12th to 13th cervical vertebrae and the right one was placed at 13th to 14th cervical vertebrae. The left thyroid gland was placed more cranially than the right one in all chickens. The left thyroid gland was displaced caudally in chickens reared in winter season than summer, whereas, the location of right thyroid gland remained constant.

In all Chabro chickens the thyroid was light pink in colour (Fig. 2, 3). However, reports indicate it to be reddish brown in chicken [2], birds [3] and Pati ducks [11], pale in budgerigar [3] and deep red in chicken [5]. The variation in colour of thyroid might be due to variation in the environment under which birds are groomed, breed, species and nutrition.

The shape of thyroid gland in Chabro chicken was oval (Fig. 2, 3) and the observation is in agreement with Dyce *et al.* (2002) [3] in birds and King and McLelland (1975) [7] in avian. However, it is reported to be lenticular and elliptical body in chicken [2, 5]. In present study the average weight of left thyroid gland was slightly less than right gland in summer season but in winter it was almost equal (Table -1). Sinha *et al.* (2016) [11] in eight weeks old Pati ducks reported that the average weight of left thyroid gland was slightly more than right thyroid gland (irrespective of season). The values of weight differed from the present study might be due to variation in species, age, environmental conditions and nutritional status. The average weight of thyroid gland

increased three times in winter season (Table -1). In present study, the length of left thyroid gland was slightly less than right both in summer as well as winter seasons (Table -1). However, Sinha *et al.* (2016) [11] in eight weeks old Pati ducks reported that the length of right thyroid gland (5.66 ± 0.003 mm) was less than left thyroid gland (5.68 ± 0.003 mm). In present study, the average length of thyroid gland in summer season reared chicken was 6.86 ± 0.22 mm and in winter was 8.87 ± 0.22 mm (Table -1). Similarly, Breit *et al.* (1998) [2] in chicken and Dyce *et al.* (2002) [3] in budgerigar reported the length of thyroid gland as 10 and 2-3 mm, respectively. The average length of thyroid gland in chickens reared in winter was significantly correlated ($r = 0.628$) with the average carcass weight of chickens reared in the same season (Table -2). The findings are in line with Firdous *et al.* (2012) [4] in eight weeks old Kuttanad ducks.

The width of left thyroid gland was 4.67 ± 0.28 and 6.93 ± 0.07 mm, respectively in summer and winter and cofigures for right one were 4.57 ± 0.19 and 6.04 ± 0.33 mm, respectively (Table -1). The width of left thyroid gland was higher than right thyroid gland in all chickens. Sinha *et al.* (2016) [11] in eight weeks old Pati ducks reported that the width of right and left thyroid was equal (4.38 ± 0.004 mm). The average width of thyroid gland in chickens reared in summer and winter was 4.62 ± 0.16 and 6.58 ± 0.21 mm, respectively (Table -1). Breit *et al.* (1998) [2] and Dyce *et al.* (2002) [3] in chicken described the width of thyroid gland was 6 and 5 mm, respectively, while Firdous *et al.* (2012) [4] reported 5.1 mm in eight weeks old Kuttanad ducks.

In present study, the average thickness of right thyroid gland was higher than the left (Table -1). In contrast, Sinha *et al.* (2016) [11] in eight weeks old Pati ducks found the thickness of left thyroid more than the right one (3.16 ± 0.003 and 3.10 ± 0.002 mm, respectively). The average thickness of thyroid gland in summer and winter was 2.96 ± 0.11 and 4.40 ± 0.15 mm, respectively. Breit *et al.* (1998) [2] described that the thyroid gland of chicken was 2 mm thick. The average thickness of thyroid gland in chicken reared in winter was highly significantly correlated with the average weight of thyroid gland ($r = 0.841$). The average thickness of thyroid gland in chickens reared in summer was significantly correlated ($r = 0.606$) with the average width of thyroid gland (Table -2). Firdous *et al.* (2012) [4] reported that the thickness showed positive correlation with body weight ($r = 0.85$) at five percent level of significance in eight weeks old Kuttanad ducks.

Table 1: Morphometrical (Mean \pm S.E.) observations of thyroid gland of chabro chickens reared in summer and winter seasons.

Parameters		Summer	Winter
		Both male and female	Both male and female
Weight	Carcass weight of chicken (g)	665.18 ^a \pm 32.99 (516 – 876.7)	1172.96 ^b \pm 54.32 (882.5 – 1452)
	Right thyroid (g)	0.05 \pm 0.01 (0.028 – 0.065)	0.12 \pm 0.01 (0.06 – 0.17)
	Left thyroid (g)	0.04 \pm 0.01 (0.023 – 0.062)	0.12 \pm 0.01 (0.07 – 0.15)
	Average weight (g)	0.08 ^a \pm 0.00 (0.066 – 0.099)	0.24 ^b \pm 0.01 (0.15 – 0.31)
Length	Right thyroid (mm)	6.91 \pm 0.28 (5.17 – 9.38)	8.94 \pm 0.55 (6.98 – 10.8)
	Left thyroid (mm)	6.82 \pm 0.36 (4.95 – 8.46)	8.81 \pm 0.49 (6.83 – 9.96)
	Average length (mm)	6.86 ^a \pm 0.22 (5.69 – 8.2)	8.87 ^b \pm 0.22 (7.93 – 10.15)
width	Right thyroid (mm)	4.57 \pm 0.19 (3.60 – 6.39)	6.04 \pm 0.33 (4.72 – 7.03)
	Left thyroid (mm)	4.67 \pm 0.28 (4.02 – 5.63)	6.93 \pm 0.07 (5.56 – 8.71)
	Average width (mm)	4.62 ^a \pm 0.16 (3.97 – 5.87)	6.58 ^b \pm 0.21 (5.88 – 8.37)
Thickness	Right thyroid (mm)	3.01 \pm 0.18 (2.31 – 3.63)	4.55 \pm 0.06 (3.06 – 5.55)
	Left thyroid (mm)	2.92 \pm 0.11 (2.37 – 4.01)	4.25 \pm 0.01 (3.44 – 4.93)
	Average thickness (mm)	2.96 ^a \pm 0.11 (2.57 – 3.82)	4.40 ^b \pm 0.15 (3.25 – 5.06)

Figures in parenthesis indicate range.

- a, b superscript showed the significant difference in average weight, length, width and thickness of thyroid gland and carcass weight of chicken reared in summer and winter season.

Table 2: Correlation coefficient among different morphometrical parameters of thyroid gland of chabro chickens reared in summer and winter seasons.

Parameters	Carcass weight		Weight thyroid		Length thyroid		Width thyroid		Thickness thyroid	
	summer	winter	summer	winter	summer	winter	summer	winter	summer	winter
Carcass weight chicken summer	1	0.265	0.358	- 0.402	0.363	0.163	0.169	0.074	0.099	- 0.642*
Carcass weight chicken winter	0.265	1	0.628*	- 0.086	0.004	0.690*	0.410	- 0.171	- 0.013	- 0.252
Weight thyroid summer	0.358	0.628*	1	- 0.268	0.135	0.266	0.042	- 0.303	- 0.367	- 0.341
Weight thyroid winter	- 0.402	- 0.086	- 0.268	1	- 0.125	0.403	0.349	0.364	0.268	0.841**
Length thyroid summer	0.363	0.004	0.135	- 0.125	1	- 0.157	- 0.174	- 0.072	0.108	- 0.047
Length thyroid winter	0.163	0.690*	0.266	0.403	- 0.157	1	0.344	- 0.173	0.005	0.123
Width thyroid summer	0.169	0.410	0.042	0.349	- 0.174	0.344	1	0.445	0.606*	- 0.070
Width thyroid winter	0.074	- 0.171	- 0.303	0.364	- 0.072	- 0.173	0.445	1	0.528	0.126
Thickness thyroid summer	0.099	- 0.013	- 0.367	0.268	0.108	0.005	0.606*	0.528	1	0.060
Thickness thyroid winter	- 0.642*	- 0.252	- 0.341	0.841**	- 0.047	0.123	- 0.070	0.126	0.060	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

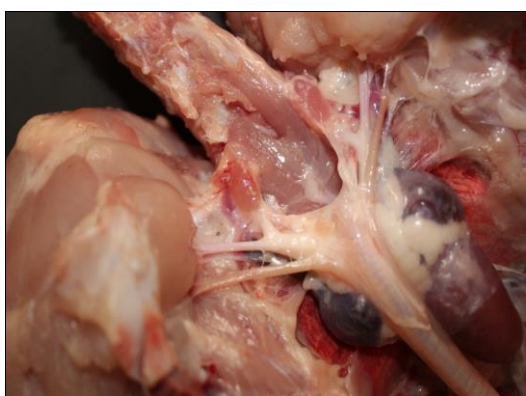


Fig 1: Photograph showing the location of right (a) and left (b) thyroid gland, common carotid artery (d), subclavian artery (e), brachiocephalic artery (f) and inverted trachea (c) in 9 weeks old male Chabro chicken reared in summer season.



Fig 2: Photograph showing the right (LF) and left (RF) thyroid gland of 9 weeks old female Chabro reared in winter season.

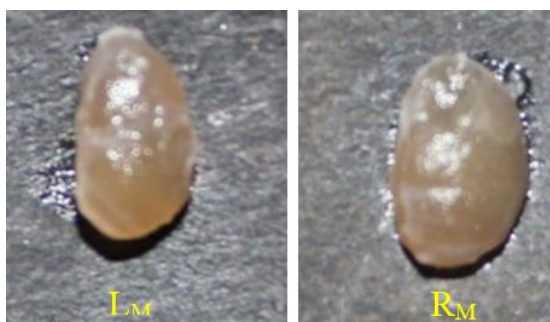


Fig 3: Photograph showing the right (LM) and left (RM) thyroid gland of 9 weeks old male chabro chicken reared in summer season.

higher weight, length, width and thickness of thyroid gland in winter as compared to summer season may be ascribed to the increased metabolism and thyroid hormones concentration in the winter season.

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Conclusion

From the present investigation it can be concluded that the

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