



# COMPARISON OF THYROID GLAND PARAMETERS WITH BODY WEIGHT AND AGE IN KUTTANAD DUCKS DURING POSTNATAL PERIOD\*

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Received - 05.04.2012  
Accepted - 23.04.2012

## Abstract

*Postnatal development of thyroid gland in the Kuttanad duck was studied using 104 female birds from day-old to 24 weeks of age. The material was collected from eight birds in each group at fortnightly intervals. The paired thyroid glands in the day-old Kuttanad duckling were placed at the base of the neck between the common carotid artery and the jugular vein. Mean weight of the thyroid gland increased gradually upto four weeks of age. Between four and six weeks there was a sharp increase in the weight of thyroid gland. Thereafter, from six weeks onwards, the increase was slow upto 20 weeks of age. Length, breadth and thickness of the thyroid increased by 3.5, 3.6 and 4.5 times, respectively from day-old to 24<sup>th</sup> week of age and showed more correlation with the age than the weight of the gland. Weight of the thyroid was more correlated with the body weight than with the age. Histological parameters of thyroid gland such as thickness of capsule and number of total, large, small, active and inactive follicles showed greater correlation with age than with the body weight.*

**Keywords:** Kuttanad duck, thyroid, postnatal, development

Normal growth and development of birds are dependent on various biological systems interconnected with each other. Endocrine system plays a vital role in proper development and differentiation of organ systems. Among the endocrine glands, thyroid is the first to develop in birds. Histomorphology of thyroid gland has been studied in avian species by several authors like Das *et al.* (1965) in duck, Singh and Bharadwaj (1982) in white leghorn chicken, Balasundaram (2000) in domestic fowl and Beyzai and Adibmoradi (2010) in ostrich. The size and function of this organ show seasonal variation and are influenced by sex hormones, nutrition and age. Literatures on comparative parameters are less in the case of water fowl; hence this work was carried out to investigate the comparison between various parameters of the thyroid gland in Kuttanad duck during postnatal period.

## Materials and Methods

Developmental pattern of thyroid gland in the Kuttanad duck was studied using 104 female birds from day-old to 24 weeks of age. The material was collected from eight birds in each group at fortnightly intervals from a single hatch and reared at the University

\*Part of M.V.Sc thesis submitted by the first author to the Kerala Veterinary and Animal Sciences University, Pookode

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Poultry and Duck Farm, Mannuthy under semi-intensive system of management. The birds were euthanized and the topography of the thyroid glands including their position and relationship were noted after dissection. The right and left glands were carefully removed and the morphometry including weight, length, breadth and thickness was recorded. After recording the gross features, the material was fixed in neutral buffered formalin. Glands were processed using routine procedures and paraffin sections of 5 $\mu$ m thickness were taken for histological studies. The sections were stained using routine procedures (Luna, 1968). The data were analysed statistically to find out the relationship of thyroid parameters with age and body weight and (Snedecor and Cochran, 1994).

## Results and Discussion

### Relationship between age and weight of thyroid gland

Upto four weeks of age, the weight of thyroid increased gradually but between four and six weeks, there was a sprut in the weight and from there onwards, the weight increased gradually with age upto 20 weeks of age (Fig. 1).

From 22 weeks, although the body weight showed a slight decrease, thyroid weight remained the same (0.99  $\pm$  0.01g) until 24 weeks. In day-old ducklings, the thyroid weighed 0.01  $\pm$  0.00g and showed more than 40 times increase by six weeks. The developmental pattern showed that there were three phases of activity for the thyroid gland during postnatal period. First phase was from the day of hatch to four weeks. The second

phase coincided with the fast growth rate of the birds between four to six weeks. The third phase, though the rate was lowest, coincided with the beginning of egg laying (18 to 20 weeks) as reported by Kaman and Yamani (1972) in Pekin ducks. During postnatal period, the thyroid weight exhibited highly significant correlation with the age ( $r = 0.93$ ) at 5% level of significance.

### Relationship between age and size of the thyroid gland

Length of the thyroid gland increased 3.5 times from 0.29  $\pm$  0.02cm in day-old birds to 0.99  $\pm$  0.01cm at 24<sup>th</sup> week of age. The breadth increased 3.6 times from 0.21  $\pm$  0.01cm in day-old birds to 0.77  $\pm$  0.00cm at 24<sup>th</sup> week. Thickness of the thyroid gland increased 4.5 times from 0.18  $\pm$  0.00cm in day-old birds to 0.82  $\pm$  0.00cm at 24<sup>th</sup> week of age (Table 1).

All the three parameters showed a highly significant correlation with age (coefficients 0.95, 0.96 and 0.99, respectively) at 5% level of significance, which was more than that with weight of the gland. Balasundaram (2000) studied the postnatal development of thyroid gland in domestic fowl and found that the length increased from 1.00mm in day-old to 8.33mm at 40 weeks of age in layers and 1.5mm in day-old to 6.0mm at eight weeks in broilers. Breadth of the gland increased from 1.00mm in day-old to 6.0mm in 28 weeks in layers and 1.00mm in day-old to 4.25mm at 8 weeks-old broilers. Results of the present study shows that Kuttanad ducks have a larger thyroid gland than that of the domestic fowl.



Fig 1. Relation between age and weight of thyroid gland in Kuttanad ducks

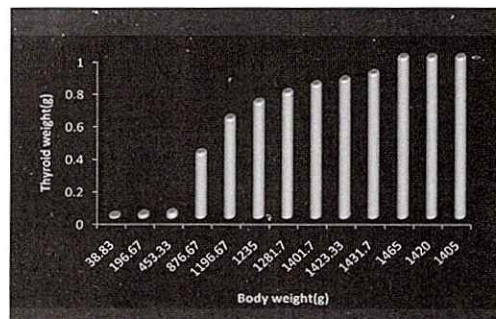


Fig. 2. Relation between body weight and thyroid weight in Kuttanad ducks

**Table 1.** Length, breadth and thickness of thyroid gland in Kuttanad ducks at different ages (Mean  $\pm$  S.E.)

Age	Length (cm)	Breadth (cm)	Thickness (cm)
Day-old	0.29 $\pm$ 0.02	0.21 $\pm$ 0.01	0.18 $\pm$ 0.00
2 weeks	0.44 $\pm$ 0.01	0.28 $\pm$ 0.01	0.21 $\pm$ 0.02
4 weeks	0.46 $\pm$ 0.01	0.37 $\pm$ 0.02	0.25 $\pm$ 0.01
6 weeks	0.53 $\pm$ 0.03	0.38 $\pm$ 0.01	0.31 $\pm$ 0.04
8 weeks	0.72 $\pm$ 0.04	0.51 $\pm$ 0.00	0.41 $\pm$ 0.02
10 weeks	0.79 $\pm$ 0.03	0.56 $\pm$ 0.02	0.44 $\pm$ 0.03
12 weeks	0.82 $\pm$ 0.03	0.55 $\pm$ 0.02	0.50 $\pm$ 0.02
14 weeks	0.86 $\pm$ 0.04	0.62 $\pm$ 0.03	0.58 $\pm$ 0.02
16 weeks	0.89 $\pm$ 0.02	0.65 $\pm$ 0.02	0.63 $\pm$ 0.01
18 weeks	0.91 $\pm$ 0.00	0.70 $\pm$ 0.01	0.68 $\pm$ 0.02
20 weeks	0.94 $\pm$ 0.02	0.73 $\pm$ 0.01	0.71 $\pm$ 0.02
22 weeks	0.97 $\pm$ 0.01	0.76 $\pm$ 0.00	0.80 $\pm$ 0.01
24 weeks	0.99 $\pm$ 0.01	0.77 $\pm$ 0.00	0.82 $\pm$ 0.00

**Table 2.** Total number of active and inactive follicles of thyroid gland in Kuttanad ducks at different ages (Mean  $\pm$  S.E.)

Age	Number of Active Follicles	Number of Inactive Follicles
Day-old	80.00 $\pm$ 0.42	4.50 $\pm$ 0.17
2 weeks	90.33 $\pm$ 1.10	5.00 $\pm$ 0.45
4 weeks	97.83 $\pm$ 1.64	7.33 $\pm$ 0.45
6 weeks	110.00 $\pm$ 0.31	8.33 $\pm$ 0.21
8 weeks	105.24 $\pm$ 1.80	15.00 $\pm$ 0.48
10 weeks	100.00 $\pm$ 1.28	23.33 $\pm$ 0.33
12 weeks	98.43 $\pm$ 2.77	25.00 $\pm$ 1.02
14 weeks	96.00 $\pm$ 1.10	29.26 $\pm$ 0.96
16 weeks	94.50 $\pm$ 2.77	34.00 $\pm$ 0.21
18 weeks	92.00 $\pm$ 1.28	40.33 $\pm$ 0.31
20 weeks	90.00 $\pm$ 1.80	46.83 $\pm$ 0.34
22 weeks	88.50 $\pm$ 0.76	56.00 $\pm$ 0.56
24 weeks	86.17 $\pm$ 0.31	62.00 $\pm$ 0.42

#### Relationship between body weight and thyroid gland parameters.

Thyroid gland contributed 0.025% to the body weight in day-old ducklings. In the adults (at 24<sup>th</sup> week), it contributed 0.070%. The relation between body weight and thyroid weight is shown in Fig. 2.

Weight of the thyroid was more correlated to the body weight ( $r = 0.94$ ) than

age during postnatal period. Length, breadth and thickness also showed a positive correlation with the body weight (coefficients 0.92, 0.91 and 0.85 respectively) at 5 per cent level of significance. The morphometrical parameters of thyroid gland such as length, breadth and thickness in Kuttanad ducks were more correlated with age than to the body weight, but weight of the thyroid gland was

more correlated to the body weight than with the age of the birds.

#### Relationship between age and histological parameters of thyroid gland

Almost all histological parameters showed an increasing trend with age. The average capsule thickness showed progressive increase with age. The total number of thyroid follicles and that of large and small follicles also increased with age. All these three parameters showed a higher degree of correlation with age than with the body weight (coefficients 0.98, 0.92 and 0.96, respectively) at 5 per cent level of significance. The number of active follicles increased upto six weeks of age and thereafter a gradual decrease was noticed till the end of the study with number of inactive follicles increasing with the advancing age (Table 2).

The mean cell height of active follicles increased from day-old duckling to six weeks old ducks. From eight weeks onwards there was gradual decrease in the cell height till the end. Similar reports are not available in birds for comparison. The increase in the active follicles upto six weeks of age might be due to need of excess thyroid hormones, as this period showed a fast degree of growth. Decrease in active follicles and increase in inactive follicles after six weeks coincided with the low growth rate and the beginning of egg laying.

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