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Age Related Histomorphometrical Studies on the Major Lymphoid Organs of Chicken

N. Dahariya[1], S. Sathapathy[1], U.K. Mishra[1], R. Patra[1], S. Dehury[1], S.K. Joshi[2], S.K. Sahu[1], L. Samal[3], Biswadeep Jena[4]

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ABSTRACT

Background: Hansli chicken is reared in Mayurbhanj and Keonjhar districts of Odisha. They play a vital role in the economic upliftment of poor, landless and marginalised people in the rural areas besides providing them with nutritious egg and meat for consumption.

Methods: Hansli chicks and Vencobb broiler chicks were divided into three age groups *viz*. group I (up to 1 month), group II (1-3 months) and group III (3-6 months) with six birds in each age group. On 4th week, 12th week and 24th week, six birds from each breed were used for the study of histomorphometrical features of the thymus, spleen and bursa of Fabricius.

Result: The average thickness of the capsule, cortex and medulla of thymus, average width of thymic lobule and average maximum diameter of Hassall's corpuscles differed significantly ($p \leq 0.05$) between the birds at specific ages. Similarly, the average thickness of the splenic capsule, average width of white pulp, average external transverse and internal longitudinal diameters of trabecular artery, average external longitudinal, internal longitudinal, external transverse and internal transverse diameters of central artery, average longitudinal diameter of capillary, average longitudinal and transverse diameters of splenic nodule, average thickness of PALS and PELS differed significantly ($p \leq 0.05$) between the birds at specific ages. The average number of bursal follicles in larger and smaller plicae, average height and width of larger and smaller plicae, average length and width of bursal follicle, average height of columnar cell of pseudostratified FAE and IFE, average nuclear height of FAE and IFE columnar cells differed significantly ($p \leq 0.05$) between the birds at specific ages.

Key words: Age, Bursa of fabricius, Hansli, Histomorphometry, Spleen, Thymus, Vencobb.

INTRODUCTION

The organized poultry sector contributes about 70% of the total output of poultry industry and the remaining 30% is shared by the unorganized sector (Ali, 2015). The indigenous breeds of chickens mostly contribute to the rural economies in most of the underdeveloped and developing countries like India (Dahariya *et al*., 2020a and Dahariya *et al*., 2020b). The environment rural relations and demand of food safety in recent years might encourage the use of native fowl in a gastronomical niche market (Ekka *et al*., 2016). Besides, providing nutritious chicken egg and meat for consumption, the native fowl play an incredible role in giving the subsidiary income to the rural people (Padhi, 2016). The Hansli chicken is reared in Mayurbhanj and Keonjhar districts of Odisha (Mohapatra *et al*., 2016). The Hansli chicken is very well adapted to the hot and humid tropical climate of Odisha and has been mainly reared for meat, egg and game purpose (Dahariya *et al*., 2020c).

The basic structures of the lymphoid organs pave the way to understand their physiology and their role in providing immunity. The studies have been reported on the lymphoid system of broiler chicken (Khan *et al.,* 2014), domestic chicken (Kannan *et al.,* 2015), Japanese quail (Senapati *et al.,* 2015) and turkey (Ali, 2016), but very scanty literature is available on the lymphoid system of Hansli chicken and Vencobb broiler chicken. So, the present study is carried out on the histomorphometrical development of major lymphoid organs in these breeds with age.

[1]Department of Veterinary Anatomy and Histology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India.
[2]Department of Animal Science, Krishi Vigyan Kendra, Jharsuguda, Odisha University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India.
[3]AICRP on Poultry Breeding, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India.
[4]Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India.

Corresponding Author: N. Dahariya, Department of Veterinary Anatomy and Histology, College of Veterinary Science and Animal Husbandry, Odisha University of Agriculture and Technology, Bhubaneswar-751 003, Odisha, India.
Email: vetdahariya@gmail.com

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MATERIALS AND METHODS

The birds (Hansli and Vencobb chicken) were divided into three age groups *viz*. group I (up to 1 month), group II (1-3 months) and group III (3-6 months) with six birds in each

age group. On 4th week, 12th week and 24th week, six birds from each breed were used for the study of histological and histomorphometrical features of the thymus, spleen and bursa of Fabricius. The tissue samples were collected and processed by routine paraffin technique (Bancroft and Stevens, 1996) and were stained by Haematoxylin and Eosin (Bancroft and Stevens, 1996). The stained sections were used for taking histomorphometric measurements of the lymphoid organs of the birds under study. It was done in micrometer (µm) by the conventional ocular micrometry after due calibration of ocular micrometer with a stage micrometer (Culling, 1974). The recorded data were subjected to routine statistical analysis (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

Thymus

The average thickness of the capsule of thymus in Hansli chicken was found to be 0.45±0.06 µm, 0.83±0.04 µm and 0.23±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of the capsule of thumus in Vencobb broiler chicken was measured as 0.7±0.11 µm, 1.1±0.06 µm and 0.26±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average thickness of the capsule of thymus was found to be significant ($p \leq 0.05$) in all the ages between the birds. The average thickness of the cortex of thymus in Hansli chicken was found to be 3.2±0.59 µm, 1.15±0.11 µm and 2.13±0.08 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of the cortex of thymus in Vencobb broiler chicken was measured as 2.8±0.19 µm, 2.03±0.13 µm and 3.06±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average thickness of the cortex was found to be significant ($p \leq 0.05$) in 12th week of age between the birds.

The average thickness of the medulla of thymus in Hansli chicken was found to be 5.3±0.97 µm, 0.44±0.18 µm and 6.5±0.18µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of the medulla of thymus in Vencobb broiler chicken was measured as 13.8±0.57 µm, 8.75±1.05 µm and 7.66±0.24 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average thickness of the medulla of thymus was found to be significant ($p \leq 0.05$) in all the ages between the birds. The average width of thymic lobule in Hansli chicken was found to be 8.4±0.97 µm, 10.0±0.47 µm and 2.06±0.08 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of thymic lobule in Vencobb broiler chicken was measured as 5.11±0.12 µm, 6.13±0.09 µm and 1.46±0.16 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of thymic lobule was found to be significant ($p \leq 0.05$) in all the ages between the birds.

The average maximum diameter of Hassall's corpuscles in thymic cortex of Hansli chicken was found to be 0.23±0.02 µm, 0.08±0.009 µm and 0.054±0.01 µm at 4th week, 12th week and 24th weeks of age, respectively. Similarly, the average maximum diameter of Hassall's corpuscles in thymic cortex of Vencobb broiler chicken was found to be 0.08±0.009 µm, 0.15±0.009 µm and 0.10±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average maximum diameter of Hassall's corpuscles in thymic cortex was found to be significant ($p \leq 0.05$) between the birds. The average maximum diameter of Hassall's corpuscles in thymic medulla of Hansli chicken was found to be 0.53±0.04 µm, 0.145±0.009 µm and 0.383±0.08 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average maximum diameter of Hassall's corpuscles in thymic medulla of Vencobb broiler chicken was found to be 0.525±0.001 µm, 0.245±0.009 µm and 0.28±0.09 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average maximum diameter of Hassall's' corpuscles in thymic medulla was found to be significant ($p \leq 0.05$) in 12th week and 24th week of ages between the birds.

Spleen

The average thickness of the capsule of spleen in Hansli chicken was found to be 0.53±0.12 µm, 2.08±0.023 µm and 2.81±0.21µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of capsule of spleen in Vencobb broiler chicken was measured as 0.15±0.02 µm, 0.14±0.01 µm and 0.34±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average thickness of capsule of spleen was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average length of white pulp in Hansli chicken was found to be 2.1±.0.05 µm, 3.05±0.01 µm and 3.20±0.11 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average length of white pulp in Vencobb broiler chicken was measured as 2.1±.0.05 µm, 3.05±0.01 µm and 3.20±0.11 µm at 4th week, 12th week and 24th weeks of age respectively. The average width of white pulp in Hansli chicken was found to be 0.55±0.09 µm, 1.11±0.06 µm and 1.53±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of white pulp in Vencobb broiler chicken was measured as 1.14±0.04 µm, 1.56±0.04 µm and 1.68±0.07 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of white pulp was found to be significant ($p \leq 0.05$) in 4th week of age between the birds.

The average external longitudinal diameter of trabecular artery in Hansli chicken was found to be 4.0±0.05 µm, 4.71±0.12 µm and 6.1±0.1 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average external longitudinal diameter of trabecular artery in Vencobb broiler chicken was measured as 2.28±0.05 µm, 7.08±0.08 µm and 7.86±0.12 µm at 4th week, 12th week and 24th weeks of age respectively. The average external transverse diameter of trabecular artery in Hansli chicken was found to be 0.48±0.05 µm, 1.03±0.08 µm and 2.73±0.08 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly,

the average external transverse diameter of trabecular artery in Vencobb broiler chicken was measured as 0.68±0.05 µm, 1.6±0.04 µm and 3.43±0.11 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average external transverse diameter of trabecular artery was found to be significant (p≤0.05) in all the ages between the birds.

The mean internal longitudinal diameter of trabecular artery in Hansli chicken was found to be 0.3±0.05 µm, 0.45±0.04 µm and 0.76±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the mean internal longitudinal diameter of trabecular artery in Vencobb broiler chicken was measured as 0.38±0.04 µm, 0.66±0.03 µm and 0.85±0.07 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the mean internal longitudinal diameter of trabecular artery was found to be significant (p≤0.05) in 12th week of age between the birds. The mean internal transverse diameter of trabecular artery in Hansli chicken was found to be 0.18±0.03 µm, 0.38±0.03 µm and 0.53±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the mean internal transverse diameter of trabecular artery was found to be significant (p≤0.05) in 4th week and 24th week of age between the birds. Similarly, the mean internal transverse diameter of trabecular artery in Vencobb broiler chicken was measured as 0.33±0.03 µm, 0.48±0.03 µm and 0.73±0.33 µm at 4th week, 12th week and 24th weeks of age respectively.

The average external longitudinal diameter of central artery in Hansli chicken was found to be 0.56±0.04 µm, 1.53±0.09 µm and 2.43±0.07 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average external longitudinal diameter of central artery in Vencobb broiler chicken was measured as 0.93±0.04 µm, 2.66±0.03 µm and 3.03±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the mean external longitudinal diameter of central artery was found to be significant (p≤0.05) in 4th week and 24th week of age between the birds. The average external transverse diameter of central artery in Hansli chicken was found to be 0.20±0.01 µm, 0.5±0.03 µm and 0.63±0.05 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the mean external transverse diameter of central artery in Vencobb broiler chicken was measured as 0.75±0.04 µm, 1.08±0.04 µm and 1.35±0.040 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average external transverse diameter of central artery was found to be significant (p≤0.05) in 4th week of age between the birds.

The mean internal longitudinal diameter of central artery in Hansli chicken was found to be 0.13±0.02 µm, 0.21±0.03 µm and 0.61±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average internal longitudinal diameter of central artery in Vencobb broiler chicken was measured as 0.33±0.04 µm, 0.76±0.01 µm and 0.98±0.04 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the mean internal longitudinal diameter of central artery was found to be significant (p≤0.05) in all the ages between the birds. The average internal transverse diameter of central artery in Hansli chicken was found to be 0.15±0.02 µm, 0.3±0.03 µm and 0.53±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average internal transverse diameter of central artery in Vencobb broiler chicken was measured 0.25±0.04 µm, 0.46±0.06 µm and 0.78±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average internal transverse diameter of central artery was found to be significant (p≤0.05) in 12th week and 24th week of age between the birds.

The mean longitudinal diameter of capillary in Hansli chicken was found to be 0.12±0.02 µm, 0.35±0.15 µm and 0.37±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average longitudinal diameter of capillary in Vencobb broiler chicken was measured as 0.07±0.009 µm, 0.18±0.02 µm and 0.31±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average longitudinal diameter of capillary was found to be significant (p≤0.05) in 4th week and 24th week of age between the birds. The average transverse diameter of capillary in Hansli chicken was found to be 0.07±0.007 µm, 0.16±0.01 µm and 0.35±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average transverse diameter of capillary in Vencobb broiler chicken was measured as 0.05±0.01 µm, 0.15±0.01 µm and 0.29±0.08 µm at 4th week, 12th week and 24th weeks of age respectively.

The mean longitudinal diameter of splenic nodule in Hansli chicken was found to be 1.3±0.08 µm, 1.45±0.02 µm and 1.66±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the mean longitudinal diameter of splenic nodule in Vencobb broiler chicken was measured as 1.009±0.05 µm, 1.32±0.04 µm and 1.59±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average longitudinal diameter of splenic nodule was found to be significant (p≤0.05) in 12th week of age between the birds. The average transverse diameter of splenic nodule in Hansli chicken was found to be 0.90±0.01 µm, 1.05±0.04 µm and 1.27±0.05 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the mean transverse diameter of splenic nodule in Vencobb broiler chicken was measured as 13.80.82±0.02 µm, 1.31±0.02 µm and 1.40±0.05 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average transverse diameter of splenic nodule was found to be significant (p≤0.05) in all the ages between the birds.

The mean thickness of PALS in Hansli chicken was found to be 0.15±0.01 µm, 0.27±0.01 µm and 0.32±0.07 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of PALS in Vencobb broiler chicken was measured as 0.21±0.01 µm, 0.35±0.02 µm and 0.43±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average

thickness of PALS was found to be significant ($p \leq 0.05$) in all the ages between the birds. The average thickness of PELS in Hansli chicken was found to be 0.1±0.01 µm, 0.166±0.008 µm and 0.26±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of PELS in Vencobb broiler chicken was measured as 0.11±0.01 µm, 0.22±0.01 µm and 0.31±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average thickness of PELS was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average thickness of PALS and PELS increased with age, which accounted for the increased blood-spleen barrier in both the Hansli chicken and Vencobb broiler chicken with age. Moreover, the average thickness of PALS and PELS was more in Vencobb broiler chicken than the Hansli chicken in all the age groups, which could be attributed to the increased blood-spleen barrier in Vencobb broiler chicken than the Hansli chicken.

Bursa of fabricius

The mean number of bursal follicle in larger plica in Hansli chicken was found to be 47±15, 84±12, 15±04 at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average number of bursal follicle in larger plica in Vencobb broiler chicken was measured as 89±13, 115±28 and 33±08 at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average number of bursal follicle in larger plica was found to be significant ($p \leq 0.05$) in 4th week and 24th weeks of age between the birds. The average number of bursal follicle in smaller plica in Hansli chicken was found to be 27±05, 43±15 and 14±02 at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average number of bursal follicle in smaller plica in Vencobb broiler chicken was measured as 34±07, 55±12 and 22±03 at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average number of bursal follicle in smaller plica was found to be significant ($p \leq 0.05$) in 24th week of age between the birds.

The mean height of larger plica in Hansli chicken was found to be 4.7±0.08 µm, 5.56±0.03 µm and 2.19±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average height of larger plica in Vencobb broiler chicken was measured as 2.7±0.02 µm, 3.00±0.04 µm and 1.8±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average height of larger plica was found to be significant ($p \leq 0.05$) in 4th week and 12th week of age between the birds. The average height of smaller plica in Hansli chicken was found to be 3.85±0.03 µm, 4.53±0.1 µm and 2.5±0.12 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average height of smaller plica in Vencobb broiler chicken was measured as 1.6±0.06 µm, 2.2±0.06 µm and 1.00±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average height of smaller plica was found to be significant ($p \leq 0.05$) in 4th week and 12th week of age between the birds.

The average width of larger plica at base in Hansli chicken was found to be 0.85±0.05 µm, 1.8±0.08 µm and 0.32±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of larger plica at base in Vencobb broiler chicken was measured as 0.44±0.03 µm, 0.9±0.06 µm and 0.14±0.02 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the average width of larger plica at base was found to be significant ($p \leq 0.05$) in all the ages between the birds. The average width of larger plica at middle in Hansli chicken was found to be 1.1±0.05 µm, 2.46±0.06 µm and 0.93±0.03 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of larger plica at middle in Vencobb broiler chicken was measured as 0.88±0.04 µm, 1.5±0.08 µm and 0.67±0.07 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of larger plica at middle was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average width of larger plica at apex in Hansli chicken was found to be 0.21±0.02 µm, 0.36±0.02 µm and 0.13±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of larger plica at apex in Vencobb broiler chicken was measured as 0.10±0.007 µm, 0.23±0.01 µm and 0.05±0.005 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of larger plica at apex was found to be significant ($p \leq 0.05$) in all the ages between the birds.

The mean width of smaller plica at base in Hansli chicken was found to be 0.55±0.01 µm, 0.52±0.01 µm and 0.30±0.002 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of smaller plica at base in Vencobb broiler chicken was measured as 0.39±0.008 µm, 0.50±0.01 µm and 0.20±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of smaller plica at base was found to be significant ($p \leq 0.05$) in 24th week of age between the birds. The mean width of smaller plica at middle in Hansli chicken was found to be 0.70±0.004 µm, 0.88±0.01 µm and 0.37±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of smaller plica at middle in Vencobb broiler chicken was measured as 0.61±0.01 µm, 0.57±0.01 µm and 0.21±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of smaller plica at middle was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average width of smaller plica at apex in Hansli chicken was found to be 0.35±0.009 µm, 0.88±0.01 µm and 0.42±0.1 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of smaller plica at apex in Vencobb broiler chicken was measured as 0.18±0.11 µm, 0.22±0.01 µm and 0.16±0.1 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of smaller plica at apex was found to be significant ($p \leq 0.05$) in all the ages between the birds.

The average length of bursal follicle in Hansli chicken was found to be 0.33±0.01 µm, 0.44±0.01 µm and 0.12±0.009 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average length of bursal follicle in Vencobb broiler chicken was measured as 0.22±0.01 µm, 0.35±0.01 µm and 0.07±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average length of bursal follicle was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average width of bursal follicle in Hansli chicken was found to be 0.17±0.007 µm, 0.21±0.01 µm and 0.10±0.007 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average width of bursal follicle in Vencobb broiler chicken was measured as 0.09±0.007 µm, 0.16±0.008 µm and 0.02±0.001 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average width of bursal follicle was found to be significant ($p \leq 0.05$) in all the ages between the birds.

The average height of columnar cell of pseudostratified FAE in Hansli chicken was found to be 0.36±0.01 µm, 0.43±0.01 µm and 0.14±0.007 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average height of columnar cell of pseudostratified FAE in Vencobb broiler chicken was measured as 0.24±0.01 µm, 0.27±0.006 µm and 0.16±0.008 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in average height of columnar cell of pseudostratified FAE (µm) was found to be significant ($p \leq 0.05$) in 12th week of age between the birds. The average height of columnar cell of pseudostratified IFE in Hansli chicken was found to be 0.17±0.009 µm, 0.24±0.01 µm and 0.9±0.02µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average height of columnar cell of pseudostratified IFE in Vencobb broiler chicken was measured as 0.13±0.005 µm, 0.17±0.009 µm and 0.1±0.006 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in average height of columnar cell of pseudostratified IFE was found to be significant ($p \leq 0.05$) in 12th week of age between the birds.

The average nuclear height of FAE columnar cells in Hansli chicken was found to be 0.07±0.007, µm 0.12±0.01 µm and 0.07±0.004 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average nuclear height of FAE columnar cells in Vencobb broiler chicken was measured as 0.05±0.005 µm, 0.06±0.008 µm and 0.05±0.004 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average nuclear height of FAE columnar cells was found to be significant ($p \leq 0.05$) in 12th week and 24th weeks of age between the birds. The average nuclear height of IFE columnar cells in Hansli chicken was found to be 0.19±0.09 µm, 0.06±0.005 µm and 0.05±0.004 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the difference in the average nuclear height of IFE columnar cells was found to be significant ($p \leq 0.05$) in all the ages between the birds. Similarly, the average nuclear height of IFE columnar cells in Vencobb broiler chicken was measured as 0.04±0.008 µm, 0.06±0.005 µm and 0.05±3.1 µm at 4th week, 12th week and 24th weeks of age respectively.

The average nuclear height of FAE basal cells in Hansli chicken was found to be 0.03±0.007 µm, 0.04±0.01 µm and 0.05±0.1 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average nuclear height of FAE basal cells in Vencobb broiler chicken was measured as 0.02±1.5 µm, 0.05±0.006 µm 0.03±0.008 µm at 4th week, 12th week and 24th weeks of age respectively. The average nuclear height of IFE basal cells in Hansli chicken was found to be 0.25±1.5 µm, 0.05±3.1 µm and 0.02±1.5 µm at 4th week, 12th week and 24th weeks of age respectively, Similarly, the average nuclear height of IFE basal cells in Vencobb broiler chicken was measured as 0.02±1.5 µm, 0.05±3.1 µm and 0.07±00 µm at 4th week, 12th week and 24th weeks of age respectively.

The average thickness of tunica muscularis in Hansli chicken was found to be 0.14±0.01 µm 0.76±0.01 µm and 0.11±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of tunica muscularis in Vencobb broiler chicken was measured as 0.22±0.01 µm, 0.76±0.13 µm and 0.15±0.008 µm at 4th week, 12th week and 24th weeks of age respectively. The average thickness of tunica serosa in Hansli chicken was found to be 0.13±0.008 µm, 0.78±0.13 µm and 0.34±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Similarly, the average thickness of tunica serosa in Vencobb broiler chicken was measured as 0.14±0.01 µm, 0.77±0.13 µm and 0.45±0.01 µm at 4th week, 12th week and 24th weeks of age respectively. Further, the micrometric data couldn't be compared due to availability of scanty literature in this area.

CONCLUSION

It was found that the difference in the average thickness of the capsule of thymus in Hansli chicken was significantly ($p \leq 0.05$) less than the Vencobb broiler chicken in all the age groups. Further, the average thickness of PALS and PELS increased with age. The present study provided a detailed baseline data on the age related development of thymus, spleen and bursa of Fabricius in Hansli chicken and Vencobb broiler chicken which could be correlated with various molecular techniques in characterization of the age related immunogenic potency of these two breeds of poultry and could be recommended to the farmers for rearing purpose.

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