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Comparative study on histomorphology of magnum in laying Kadaknath and white leghorn fowl

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Abstract

The comparative study was conducted on female reproductive system of 48 layers of Kadaknath and White Leghorn with 24 birds in each breed. These birds were divided into 04 groups viz; group I (24 weeks), group II (32 weeks), group III (40 weeks) and group IV (48 weeks). Gross morphological and histological observations revealed the presence of fibromelanin in the magnum of Kadaknath which confirms fibromelanosis in the reproductive system of this native breed. The mean length of the magnum was 2.22 ± 0.09 cm in group I of Kadaknath which suddenly increased to 23.70 ± 0.94 cm in group II. However, in WLH the length was 34.38 ± 1.07 cm in group I which gradually reduced and became 17.48 ± 1.02 cm in group IV. The wall thickness of magnum was 315.92 ± 1.79 μ m in group I which increased to 685.67 ± 1.71 μ m in group IV of Kadaknath fowl. The wall thickness was greater in WLH in comparison to Kadaknath except in group IV where total wall thickness in Kadaknath (685.67 ± 1.71 μ m) was greater than WLH (448.54 ± 3.02 μ m).

Keywords: Histomorphology, Kadaknath, white leghorn, layers, magnum

1. Introduction

Kadaknath is an important Indian breed of poultry, is well known as Kalamashi and mostly reared by tribal peoples of Dhar and Jabua districts of western Madhya Pradesh. These birds are also resistant to extreme climatic conditions like summer heat and cold stress as well as thrive very well under adverse environment like poor housing, poor management and poor feeding^[15]. First egg produced by Kadaknath is at the age of 29 weeks^[11]. The egg production is less and ranges between 80 to 90 per year with an egg weight of 49 g^[10]. Maturity in White Leghorn attains early than Kadaknath breed and start laying at about 19 weeks of age^[14]. Birds peak lay period is from 25 to 39 weeks of age when they lay on average nearly one egg per day. White Leghorn are the best known of the egg producing fowl averaging between 300 to 350 eggs per year with an egg weight of 50 to 55 g. Comparative study on the ovaries of Assel and RIR fowl raging from 2 weeks to 13 months was conducted^[13]. However, comparison between magnum of Kadaknath and White Leghorn is lacking. Therefore, the present study has been undertaken to know the gross and histological features of magnum in laying Kadaknath and White Leghorn fowl.

2. Materials and Methods

The experiment was conducted on gross and histomorphology of the reproductive system of 48 female birds, comprised of 24 Kadaknath and 24 White Leghorn (WLH) breed. These birds were divided into 04 groups viz; group I (24 weeks), group II (32 weeks), group III (40 weeks) and group IV (48 weeks). Birds were procured from All India Co-ordinated Research Project on Poultry, Livestock Farm, Krishinagar, Adhartal, Jabalpur (M.P.). Whereas, White Leghorn were collected from the Phoenix poultry farm, Jabalpur. Gross and histological observation were made on different parameters of magnum and data were analyzed statistically.

3. Results and Discussion

The gross observation revealed that the colour of the magnum was grayish in all the groups of Kadaknath, however in group IV the colour intensity was reduced. In WLH, it was white in colour in all the groups. This finding confirms the presence of fibromelanin in gonads of Kadaknath. The study done by Lucanov and Genchev (2013) supports the present study who reported the presence of the fibromelanosis in some of the breeds of fowl of south eastern Asia^[6].

The mean length of the magnum increased to 23.70 ± 0.94 cm in group II. However, in WLH the length was 34.38 ± 1.07 cm in group I which gradually reduced and became 17.48 ± 1.02 cm in group IV (Table 1). The length of the magnum was 27.00 ± 1.15 cm in group III of Kadaknath which is in accordance with the findings of Garg (2006) who reported the length of magnum as 29.80 cm in Kadaknath [2]. However, Mishra *et al.* (2014) reported mean length of magnum in native chicken of Bangladesh 18.40 ± 6.75 cm which is less than the length of magnum of Kadaknath and WLH in the present study [8]. The lumen of the magnum was elongated in group I of Kadaknath which became irregular star shaped in later groups and all the groups of WLH. The wall of the magnum presented tall, thick longitudinal primary and secondary folds in all the groups of WLH and Kadaknath except in group I of Kadaknath where these folds were short and blunt with few secondary folds (Fig. 3 and 4). The number of primary folds in group I were 08 and 12 in Kadaknath and WLH, respectively which increased to 15 and 17 in later groups.

Table 1: Mean regional length (cm) and width (cm) of magnum in Kadaknath and White Leghorn breeds of fowl

Groups		Magnum	
		Length	Width
I	Kadaknath	2.22 ± 0.09	0.30 ± 0.12
	WLH	34.38 ± 1.07	1.73 ± 0.07
II	Kadaknath	23.70 ± 0.94	2.07 ± 0.09
	WLH	26.00 ± 0.65	1.68 ± 0.12
III	Kadaknath	27.00 ± 1.15	1.75 ± 0.14
	WLH	22.57 ± 2.07	1.52 ± 0.10
IV	Kadaknath	23.25 ± 0.77	1.95 ± 0.05
	WLH	17.48 ± 1.02	1.78 ± 0.16

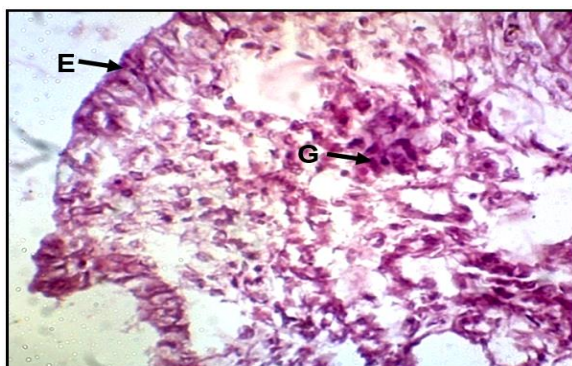


Fig 1: Photomicrograph - Cross section of magnum (group I, Kadaknath) showing epithelium (E) and developing glands (G). H&E X 400



Fig 2: Photomicrograph - Cross section of magnum (group I, WLH) showing epithelium (E) and densely packed glands (Tg) in the propria submucosa. H&E X 400

At 48 weeks of age, thickness of magnum wall was 685.67 ± 1.71 μ m and 448.54 ± 3.02 μ m in Kadaknath and WLH, respectively (Table 2). The wall thickness was more in Kadaknath in comparison to White Leghorn shows more glandular activity in the magnum of Kadaknath. However, at 13 months of age other researcher reported magnum wall length as 400.25 μ m and 444.25 μ m in Aseel and RIR respectively [12]. The mean height of epithelium at 48 weeks of age was 17.56 ± 0.45 μ m in Kadaknath and WLH respectively. However, Shyam (2012) reported it as 22.53 μ m and 19.06 μ m in Aseel and RIR respectively [12]. At 24 weeks of age height of epithelium in Kadaknath was 15.05 ± 0.46 μ m which was greater than present findings with an average of 24.60 μ m.

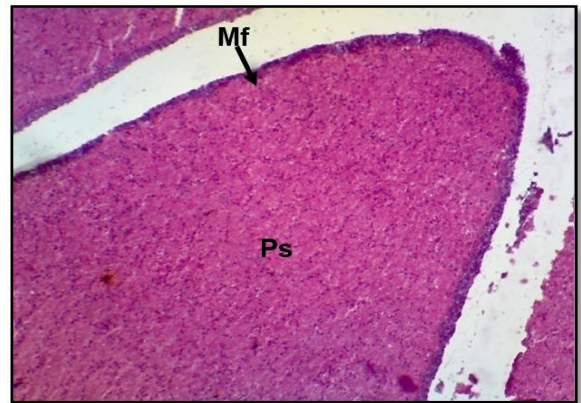


Fig 3: Photomicrograph - Cross section of magnum (group II, Kadaknath) showing mural folds (Mf) and densely packed glands in the propria submucosa (Ps). H&E X 100



Fig 4: Photomicrograph - Cross section of magnum (group II, WLH) showing mural folds (Mf) and glands in the propria submucosa (Ps). H&E X 100

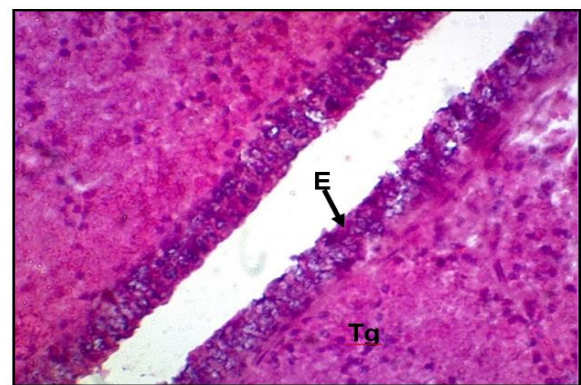


Fig 5: Photomicrograph - Cross section of magnum (group II, Kadaknath) showing epithelium (E) and densely packed tubular glands (Tg) in propria submucosa. H&E X 400

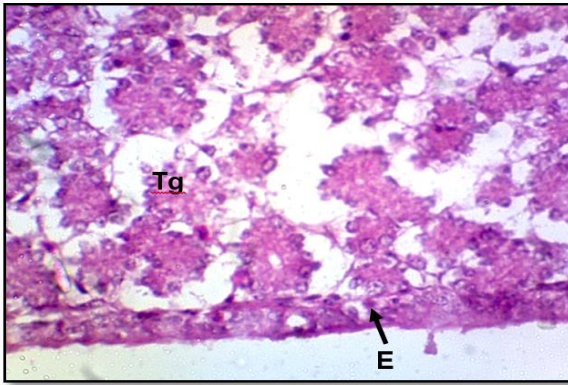


Fig 6: Photomicrograph - Cross section of magnum (group II, WLH) showing epithelium (E) and tubular glands (Tg) in propria submucosa. H&E X 400

Table 2: Range and mean (μm) of different parameters of magnum in group I to IV of Kadaknath and White Leghorn breeds of fowl

Parameters		Kadaknath				White Leghorn			
		Groups							
		I	II	III	IV	I	II	III	IV
Thickness of magnum Wall	Range	306.00-323.00	510.00-544.00	595.00-612.00	680.00-697.00	510.00-544.00	544.00-578.00	595.00-629.00	425.00-459.00
	Mean \pm SE	315.92 \pm 1.79	525.58 \pm 3.12	602.08 \pm 1.79	685.67 \pm 1.71	524.17 \pm 2.90	556.75 \pm 3.01	604.92 \pm 2.75	448.54 \pm 3.02
Height of epithelium	Range	12.90-17.20	12.90-17.20	12.90-21.50	17.20-21.50	12.90-17.20	17.20-21.50	21.50-25.80	12.90-17.20
	Mean \pm SE	15.05 \pm 0.46	16.13 \pm 0.40	16.48 \pm 0.51	17.56 \pm 0.45	14.69 \pm 0.45	20.07 \pm 0.43	23.29 \pm 0.45	14.69 \pm 0.45
Size of epithelial nuclei	Range	2.15-3.22	2.15-3.22	2.15-3.22	2.15-3.22	2.15	4.30	4.30	2.15
	Mean \pm SE	2.51 \pm 0.11	2.86 \pm 0.11	2.95 \pm 0.10	3.04 \pm 0.09	2.15 \pm 0.00	4.30 \pm 0.00	4.30 \pm 0.00	2.15 \pm 0.00
Thickness of tunica mucosa	Range	13.74-18.46	13.86-19.43	13.54-19.86	18.34-22.64	13.65-18.68	18.63-22.67	22.86-26.89	13.68-18.69
	Mean \pm SE	15.96 \pm 0.59	17.14 \pm 0.37	17.65 \pm 0.35	18.47 \pm 0.81	16.37 \pm 0.51	21.65 \pm 0.37	24.75 \pm 0.37	16.04 \pm 0.69
Thickness of tunica muscularis	Range	153.00-170.00	170.00-187.00	187.00-204.00	204.00-221.00	102.00-119.00	136.00-153.00	136.00-153.00	102.00-119.00
	Mean \pm SE	161.50 \pm 1.81	178.50 \pm 1.82	195.50 \pm 1.81	213.92 \pm 1.80	114.75 \pm 1.57	140.25 \pm 1.57	145.92 \pm 1.79	108.54 \pm 1.76
Thickness of tunica serosa	Range	51.00-68.00	68.00-85.00	85.00-102.00	102.00-119.00	68.00-85.00	85.00-102.00	102.00-119.00	85.00-102.00
	Mean \pm SE	60.92 \pm 1.79	76.50 \pm 1.81	92.08 \pm 1.79	111.92 \pm 1.79	83.58 \pm 1.00	92.08 \pm 1.79	106.25 \pm 1.57	90.67 \pm 1.71

In propria submucosa of Kadaknath and WLH well developed long branched coiled tubular glands were present except 24 weeks of Kadaknath, in which developing glands were noticed (Fig. 5 and 6). This observation confirms the finding of other researcher [11]. They reported that first egg produced by Kadaknath at the age of 29 weeks. In WLH the density of glands decreased from group II onwards indicative of gradual decrease of egg production.

4. Conclusion

Comparative study on the magnum of Kadaknath and WLH fowl was done on the basis of histomorphology method and concluded that at 48 weeks of age thickness of magnum wall was more in Kadaknath than WLH. Primary and secondary folds were observed in Kadaknath and WLH except in 24 weeks of Kadaknath and propria submucosa of Kadaknath and WLH well developed long branched coiled tubular glands were present except 24 weeks of Kadaknath. So study indicated that Kadaknath breed of fowl attains maturity at late age than WLH and concluded that Kadaknath breed is less efficacious on the egg production performance than WLH breed of fowl.

5. Acknowledgement

We declare that we have no conflicts of interest

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The epithelium was ciliated simple columnar with goblet cells (Fig. 1, 2, 5 and 6). The present observation is in line with findings of Bharti and Gautam (2013) and Islam *et al.* (2001) as they recorded simple columnar ciliated epithelium [1, 4]. However, Mehta *et al.* (2005) reported pseudostratified columnar epithelium with goblet cells [7]. Primary and secondary folds were observed in the present study in Kadaknath and WLH except in 24 weeks of Kadaknath, in which only primary folds were seen. The present finding is in agreement with findings of Garg (200) and Bharti and Gautam (2013) [1, 2]. However, (Gilbert 1970; King 1975 and Nickel *et al.* 1977) reported only primary folds [3, 5, 9].

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