

Gross And Microscopic Changes In The Gonads Of Male And Female Domestic Pigeon (*Columbia Livia*)

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ABSTRACT: The study was undertaken to observe the gross features of the male and female pigeon as well as the behavioral patterns and histological features of their gonads with the aim of establishing their sexual characteristics as a mode of identifying their sex. Seven pairs of pigeon age at 1, 2, 4, 11, 12, 13 and 14 weeks were purchased from local breeders and reared under controlled conditions before they were used in this study. A pair of bird was sacrificed at a time after body weights were recorded. The gonads were then dissected out and weighed wherever possible before being subjected to histological studies using routine Haematoxylin and Eosin (H & E) staining technique. Grossly, the colour pattern and feather did not show any obvious difference between the male and female. A pair consists of male and female. A male weighed more (120g at one week and 360g at week fourteen) than the female (90g at week one and 250g at week fourteen). On dissection, male presents two testes while the female present only one ovary on the left side. By 4th week the male began to show more aggressive behavior than the female on “beak tests” recorded for the first time in the present study. Histologically, the male pigeon showed well developed testes from 11 weeks onward with the seminiferous tubule, straight tubule and interstitial cells of leydigs in it. The ovaries in the females could be recognized with follicles in them by 4 weeks of age. The follicles became very prominent and large by 11 weeks and the Graafian follicles could be recognized by 13 weeks of age. It was concluded from the above observation that within a set of pairs, the large one could be safely considered as the male and it will be more aggressive than its female counterpart. Histologically, the birds seem to show sexual maturity by 11-12 weeks with females ovulating by 13 weeks. It is therefore safer to buy pigeons in pairs of the same age from a renowned breeder than in the market for breeding purpose. [New York Science Journal. 2010;3(10):108-111]. (ISSN: 1554-0200).

Key words: Pigeon, Testis, Ovary, Seminiferous tubule, Graafian follicles.

INTRODUCTION

The pigeon (*Columbia livia*) is one of the commonest birds kept and bred by amateurs as ornamental birds, messenger and for meat purpose and a member of the bird family *Columbidea* (doves and pigeons) (Gibbs *et al.*, 2007).

They are robust, resistant to disease and easy to keep requiring only simple cage and equipment and little space and can be kept on free range. Pigeons breed at any time of the year but peak times are spring and winter (*Columbia livia*, http://www.amonline.net.au/factsheets/rock_dove.htm). They mature early and lay eggs which take a short time for incubation (17-19 days) Murton and Clerk (1968) incubation is shared by both parents (Levi, 1977). Pigeon production is cheap as the pigeons are mostly kept on free range with only small boxes or houses, which accommodate them. They are monogamist in that a pair of male and female is borne together (Anonymous, 1984) that is two squabs per brood. Both parents care for the young for a time (Levi, 1977). The nestling has pale yellow down and a flesh-coloured bill with a dark band. It is tended

and fed on “crop milk” like other doves. The fledging period is 30 days (Jahan, 2008).

Pigeons have small heads, short necks, short bodies with short legs and slack plumage and have a fleshy or waxy protuberance, the cere, at the base of the beak.

The sexual morphological characteristics of pigeon however, cause a major problem to amateur who rear them which necessitates this study.

MATERIALS AND METHODS

A week to about four weeks old pigeons (squab-paired) were obtained from local breeders where some of them were allowed to grow to about ten to fourteen weeks old. The pigeons were kept in the laboratory and were fed with grain (millet) and sometimes rice. Water was given ad-libitum.

SAMPLING PROTOCOL AND ANALYSIS

Slaughter of the pigeons commenced from a week old and then every week for weeks 1, 2, 4, 12, 13 and 14. The birds were weighed and physical features were noted, colours of feathers were noted, colour of feathers (plumage), presence or absence of

feathers on the shank and activeness of the birds were checked. The pigeon were sacrificed by cutting the skin of the neck, jugular vein, trachea with scapel blade. Feathers were removed by sprinkling water on the pigeon to wet them and aid in the removal (easy removal). They were eviscerated and the genitalia were removed, i.e. the testes and ovaries.

The ovaries and testes being removed are weighed on a sensitive balance. Samples of the testes and ovaries at different ages were taken and fixed in formal saline for histological processing.

HISTOLOGICAL PROCEDURE

Testes and ovaries for each group were used for histological studies. The specimens for histological study were taken by slicing the testes and ovaries along their longitudinal axis. Tissue samples were processed and stained with Haematoxylin and Eosin according to the procedure of Luna (1968).

RESULTS

GROSS OBSERVATIONS

Gross gonadal weight of male and female pigeon as well as the body weight is shown on table 1. In general, the male pigeon was observed to weigh more than the female.

WEEK I

Both birds were walking on their hock, down feathers which were seen at birth were still prominent and new ones are coming out. Male bird is more active than the female. On dissection, the gonads were seen but not very distinct.

WEEK II

The size of the two nearly the same and so can be confused, but the male is more active than the female. The feather development was slower in the female than the male. However, all the feather types seen in the male were also present in the female.

WEEK III

On the beak test, the male is more active than the female while the female remains calm, the male powerfully withdraws its beak.

Distinct feather coat (colour) is vivid at this age, though mixed without prejudice. The body is well covered with feather except at the sternal region; all types of feathers are found at this age. The testes were seen as milky in colour, been shaped on the

abdominal region. The ovary is ovoid and also milky in colour seen only on the left side.

Feathers were seen on the shank of the male.

WEEK IV

The male is bigger than the female and also more active than the female. There is the presence of feather on the shank (ptilopody) but more in male than the female. Increase in size of both the testes and ovaries are seen.

MICROSCOPIC FINDINGS

The study was carried out using Haematoxyline and Eosin stained sections of the testes and ovaries. The following results were obtained:

TESTES

At week I, Seminiferous cords were seen. At week II, there is presence of seminiferous tubules with clusters of cells. Seminiferous tubules and straight tubules were prominent and clusters of interstitial cell of leydig's are seen at week XI. At week XII there was presence of seminiferous tubules and straight tubules but not luminised. There is lumina formation in the seminiferous tubules with some cells seen within the lumen. Evidence of sperm cells in the seminiferous tubules at week XIII. Week XIV also reveals features as seen in week XIII. Sperm cells more prominent at this age with other cells at different stages of development.

OVARIES

There is absence of ovarian follicles at week I and II. At week IV, Follicles were seen at different stages of development and follicular epithelium surrounded by theca interna. At week XI there is well formed oocyte and many follicles seen. The oocyte has nucleus with yolk laden cytoplasm. At week XII, there is evidence of new follicles being formed in group with a few large oocyte surrounded by small oocytes. Each follicle has an oocyte surrounded by a follicular epithelium. Oocyte has a large nucleus and yolk laden cytoplasm. At week XIII, there is a well developed oocyte with nucleus and yolk laden cytoplasm and follicles at their early stage of development, follicles with membrana granulosa. Graafian follicles are seen with evidence of proliferation of membrana granulosa forming a thick layer. At week XIV, there is a well developed oocyte and Graafian follicles as seen in week XIII.

TABLE 1: Age related changes in the body weight and gonads between pairs of males and females pigeon.

Age in weeks	Sex	Body weight (g)	Testes(g)	Ovary(g)
1	M	120	0.0131	-
	F	90	-	0.0334
2	M	110	0.0422	-
	F	100	-	0.0421
4	M	210	0.0279	-
	F	200	-	0.0640
11	M	300	0.0587	-
	F	250	-	0.0576
12	M	300	0.0607	-
	F	280	-	0.0773
13	M	300	0.1068	-
	F	310	-	0.1565
14	M	300	0.2217	-
	F	250	0	0.2552

DISCUSSION AND CONCLUSION

From the result obtained in this study, it was observed that weight and size of the gonads increase with age. This is in agreement with the findings of Kumaran and Turner (1949).

Age is been shown to be a factor of maturity. This is evident by the fact that seminiferous tubules were not apparent at week I of age, but could be recognised at two weeks of age. The presence of prominent seminiferous tubules and the interstitial cells of leydis at later age (week II) are suggestive that semen can be produced at this age. This has been demonstrated by earlier workers in other species of birds (Kumaran and Turner, 1949). Sturkie (1954) proved the interstitial cells of leydis are the source of male hormones (Androgens). In the same way, the findings suggested that at week II the male hormones are already in the system. This is also influenced by behavioural pattern and sexual sound (cooing sound) made by male pigeon as they approach puberty.

The marked lumen formation in the straight tubules seen from week 12 coupled with the presence of sperm cells within the lumen and presence of interstitial cell of leydis indicates the birds are at maturity and can be used for breeding.

In the female, there are no ovarian follicles as seen at early stages (week 1 and 2). The presence of follicles as from week 4 also supports the fact that development progresses as the birds increase in size. The presence of Graafian follicle suggested the onset of maturity in other specie of birds (Gartner and Hiatt, 2000).

From the gross observation, it could be seen that the pattern of feathers in the various regions of the body did not show any difference between male and female. According to Rock Pigeons (2003), there are few visible differences between the males and

females. However, from the recording of the body weights of the birds, the males generally weighed heavier than the female amongst a set of pairs. Also pair of birds hatched at the same time seems to consist of a male and a female. This will become apparent when the “beak test” is applied in present study. This observation is being recorded for the first time.

In conclusion, it was observed that amongst a pair of same age, the male are larger than the female, colour pattern does not show any sex variation, the feathers on the shank (ptilopody) is both in male and female. The male are apparently more active than the female, feather around the neck region (hackle feathers) of the male can be raised in aggression but not seen in female. But the use of the above should not be as sole yardstick in differentiating between male and female pigeon.

From the above study, it is recommended that for sexing, size and “beak test” can be used and pigeons could be bred from 13 weeks of age.

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