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Research Article

THE OVARY OF FRUIT BAT *ROSSETUS AEGYPTIACUS* (MEGACHIROPTERA: PTERPODIDAE) IN SOUTHERN IRAN

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ABSTRACT
Bat is flying mammals that with eating fruit, interferes in pollination of many plants and with eating insect aid to control of pest and due to balance ecosystem. Therefore, biologic study aid to protecting them. In the present research 4 female egyptian fruit bats (*Rossetus aegyptiacus*) were captured by mist net in Gorm cave (southern Iran). They were transferred to the laboratory, anesthetized and dissected their ovaries. After measuring weight, length and diameter of ovaries, they were fixed in formalin (4%), were dehydrated in graded series of ethanol (70%-100%), then impregnated with paraffin and serial Sections (5µ thickness) were prepared. The transverse and longitudinal sections were subjected to Haematoxylin and Eosin (H&E) stains, mounted on binocular microscope (40x and 10x) and micrographs were taken with digital camera. Obtained data analyzed by SPPS (20) and ANOVA test. Ovarian morphometric results revealed that there is no significant difference between the left and right ovary ($P<0.01$). Obtained micrographs showed recognizable germinal layer with high cell junctions, vascular stroma and fat particles. The sexual stages include immature, mature and graafian were detected in ovaries and no significant histological differences were observed in tip, middle and end of ovaries. The most population of follicle belongs to primordial (28. 20 ±0.03) and primary follicles (10.5± 0.05) and one graafian follicles was seen near the epithelium. Microscopic structure is similar to other mammals. According to obtained finding, ovarian tissue in this species is heterogeneous and sexual cycle is active in summer.

Keywords: *Ovary, Bat, Follicle, Oogensis*

INTRODUCTION
The bat is considered to be one of the slowest reproducing animals in the world because their pregnancy period is due to variety of adaptations possessed by them in response to environmental conditions in which they live (Parris and Hazell, 2005). *Rossetus aegyptiacus* belong to Pteropodidae is the only megachiropteran bat in Iran (Benda *et al*., 2012). They are polygamous species (A male mate with a large number of females) and their gestation length is 3.5 to 4 months. So they have biannual breeding seasons. Breeding takes place during the summer and late fall or winter (Baydemir and Albayrak, 2006). Although sperm is transferred to the female during copulation that occurs in the fall, ovulation and fertilization of the egg are delayed until the females following spring and childbirth happen in spring (Kwiecinski and Griffiths, 1999). The ovary is the most important organ in reproductive system for ovum-producing. Ovarian follicles and oogensis had been observed in many mammalian species as mouse (Pepling *et al.*, 2007), rabbit (Zamboni *et al.*, 1968) and other mammals (Matova and Cooley, 2001; Dorlikar *et al*., 2013). Also female reproductive system of bat was studied by some researchist as Krishna and Dominic (1980) and Komar *et al*., 2007) and others. The polarity in structure and function of left and right ovary and reproductive asymmetry are seen in the some bat (Wimsatt, 1979), some bat as genus Myotis have an annual estrous cycle and they have a single ovum each year (Elizabeth, 2013) but most of them have two or more estrous cycle and ovum (Pillai, 2004; Baydemir *et al*., 2006). Bats have different patterns of fertility which is affected by the environmental conditions and access to food resources. Since these factors can be different in various environments where bats live (Racey *et al*., 2000; Elizabeth, 2013). Sperm storage in female uterus and vagina are the mechanism for successful reproduction (Sharifi *et al*., 2004). Although ovary occur in a wide variety of animals, but there is principle sex organ responsible for oogenesis in all of them (Lechowska *et al*., 2012). For this reason, the microscopic structure of ovary in *R. aegyptiacus* was studied.

MATERIALS AND METHODS

Gorm cave (53˚18' E and 28˚ 45' N) is placed in the Fars Province in south of Iran (Figure 1). This cave is roost for a large colony of *R. aegyptiacus* (Figure 2). In present research, 4 female egyptian fruit bats (*Rossetus aegyptiacus*) were captured by mist net during in July. Then they were transferred to the laboratory, anesthetized and dissected their ovaries. After weighting the isolated ovaries and measuring the length and diameter of them, they were fixed in formalin (4%), placed in tissue processor. The samples were dehydrated in graded series of ethanol (70%-100%), and then impregnated with paraffin and serial Sections (5µ thickness) were prepared. The transverse and longitudinal sections were subjected to Haematoxylin and Eosin (H&E) stains, mounted on binocular microscope (40x and 10x) and micrographs were taken with digital camera. Obtained data analyzed by SPPS (17) and ANOVA test. The microscopic structure of ovary and follicles was studied and the follicles were counted.

RESULTS AND DISCUSSION

The both spherical and white ovaries were similar (Figure 3) with approximate weight 0.035 g, less of 2 mm length and 1.2 mm diameter. No significant difference was observed between them ($P < 0.01$). According to the micrographs, maturation of follicles was seen in ovaries and no difference in tip, mid and end of ovaries. Although distribution and density of follicles were different from cortex to medulla of each ovary. Recognizable germinal layer with high cell junctions, vascular stroma and many fat particles were observed in micrograph (Figure 4). Cortex was thin and many Primordial and primary follicles were embedded in it (Figures 5, 6).

Table 1: Follicular population in ovary of *Rossetus aegyptiacus* in summer (2014)

Primordial. F	Primary.F (unilaminar)	Primary.F (multilaminar)	Secondary. F	Atretic F	Graafian F
28.20 ±0.03	10.50 ±0.05	4±0.04	3±0	2±0.02	1±0

Table 2: Ovarian morophometric results of *Rossetus aegyptiacus* in summer (2014)

Body.W(g)	Ovarian.W(g)		Ovarian.L(mm)		Ovarian.D (mm)	
122 ±0.20	0.34±0.09(L) (R)	0.36±0.09	1.90±0.09(L) (R)	2.06±0.02	1.28±0.09(L) (R)	1.14±0.09

W: weight L: length D: diameter

Figure 1: Gorm cave in southern Iran

Figure 2: *Rousettus aegyptiacus*

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Figure 3: Female reproductive system

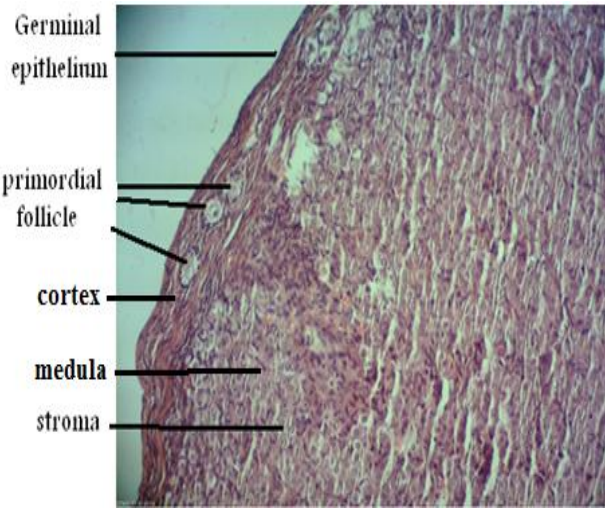

Figure 4: Ovarian tissue (10 x)

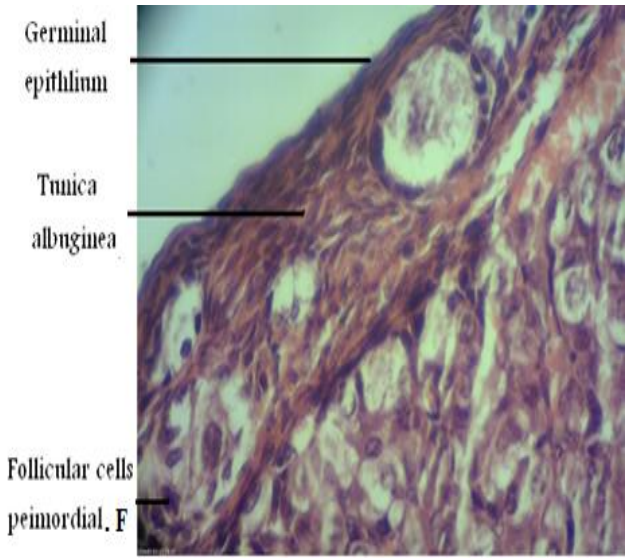

Figure 5: Folicular type (40 x)

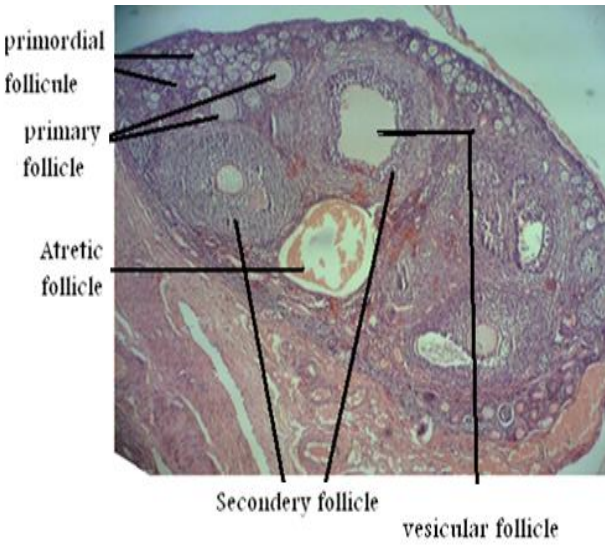

Figure 6: Folicular type (10 x)

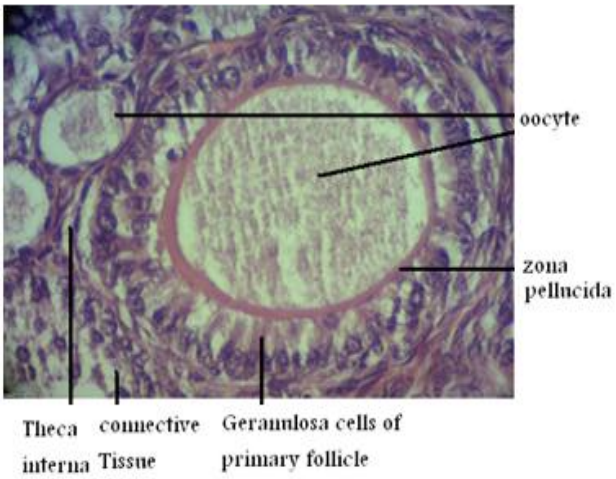

Figure 7: Primary follicle (40 x)

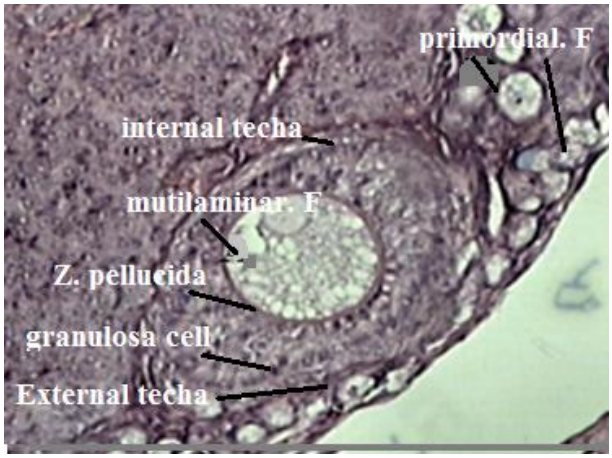

Figure 8: Multilaminar follicle(40 x)

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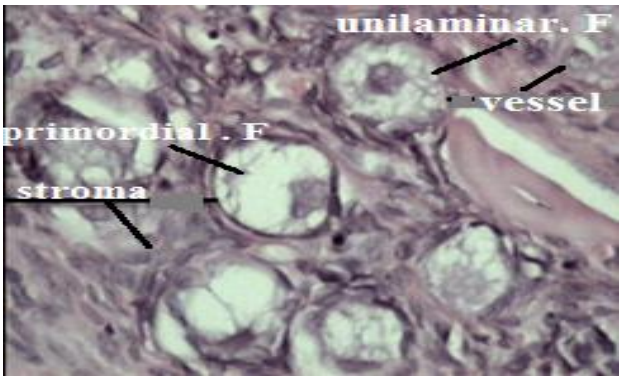

Figure 9: Folicular type (40 x)

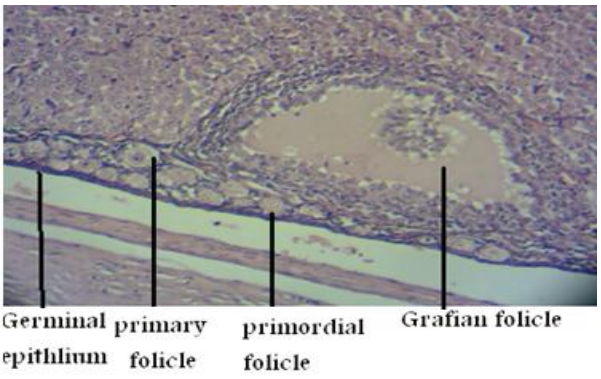

Figure 10: Graafian Follicle (10 x)

Primordial follicle (Figures 5, 9) was composed of an oocyte surrounded by granulosa cells resting on the basement membrane. Unilaminar primary follicle by single layer of 10–12 cuboidal granulosa cells (Figures 7, 9) and multilaminar primary follicles have many cells in 3- 4 layers (Figure 8). One secondary F was recognized with antrum (Figure 6) and atretic. F and graafian. F also was observed near epithelium (Figures 6, 10).

Although in the sum of bats, the right ovary is significantly larger than the left (Komar *et al.*, 2007) but the results of present study according to previous study about human's ovary (Rani and Devi, 2011) and in cattle (Belloa *et al.*, 2012) indicate no difference in morphology and morphometry between the two ovary.

Presence the variety of follicular types in both ovaries showed that oogensis may be in each ovary and no polarity was seen. Although graafian follicle was seen in right ovary (Figure 8) and it indicated that one ovum was released in each estrus cycle and probably the ovaries act periodic as alternation of ovulation between ovaries in some species of bat was observed (Rasweiler, 1988).

Various ovarian patterns are seen in bats which have taxonomic value. In many families as Vespertilionoid, ovary is interstitial tissue with arrangement similar to other mammals (Rani and Devi, 2011). Existence many follicles within the examined ovary might be stimulated to grow, so obtained results according to obvious finding (Lechowska *et al.*, 2012) showed that this spices is in active phase. Maximum value belongs to primordial and primary follicles that exist from embryonic age (Lechowska *et al.*, 2012).

The number of secondary follicles must more than which were seen since this phase is a transients phase and short time, May they aren't seen. As the follicles mature, they occupy medulla of ovary and present of graafian. F near the surface (Figure) indicated that ovulation unlike horse (Klaus-Dieter *et al.*, 2008) but as some mammals, occurs in the cortex (Matova and Cooley, 2001; Dorlikar *et al.*, 2013).

Based on the obtained results, seems that summer is breeding time for *R. aegyptiacus* in the research region (Gorm cave). The large population of baby on the one hand and some pregnant bat on the other hand, indicated that this species is active in all year. Since the gestation period for *R. aegyptiacus* is 4 months (Kwiecinski and Griffiths, 1999). The warm temperature and abundance of food (orchards and farms) in the research region may due to sex activity in this species (Parris and Hazell, 2005; Elizabethw, 2013).

Conclusion

Obtained finding showed that ovarian tissue in this species according to the general plan in mammals and it is heterogeneous. Also seems, sexual cycle of *R. aegyptiacus* is active in summer and this time is proper for breeding.

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