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Study of follicular population with relation to different seasons in sheep ovaries

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Abstract
The present study was done to observe the follicular population with respect to three different seasons viz., winter, summer and rainy in sheep ovaries. Six hundred ovaries were collected in each season and the numbers of surface follicles were recorded. Among the three seasons, number of small, medium, large size and total surface follicles in each ovary was high (P<0.05) during winter season and significantly lower in summer compared to other season. The mean number of small surface follicles were statistically higher (P<0.05) in all the three seasons. It was evident from the result that in winter season number of total surface follicles in sheep ovaries was higher compared to summer and rainy season.

Keywords: Sheep, seasons, ovaries, follicular populations

Introduction
Reproductive behaviors of ewes are greatly influenced by season which is characterized by absolute changes in endocrine, ovulatory levels and sexual behavior. Sheep is a seasonal breeder species and a great influence of different seasons occurs on their hormonal and systemic changes, affecting efficiency of *In vitro* embryo production (IVEP). Photoperiodism mediated through the action of melatonin hormone mainly controls seasonality (Webster *et al.*, 1991) [13] (Lincoln, 1998) [7]. Therefore, this experiment was designated to observe the follicular population with respect to different seasons in sheep ovaries.

Materials and Methods
Sheep ovaries were obtained from local slaughterhouse in thermos containing physiological saline (0.9%, w/v, NaCl) and antibiotic (100 µg/ml streptomycin and 100 IU/ml penicillin) at 37 °C within an hour of slaughter of sheep. In the laboratory surrounding tissue and overlying bursa of each ovary was removed, rinsed in physiological saline and 70% alcohol followed by three washings in Dulbecco's Phosphate Buffer Saline (DPBS) with antibiotics. Total six hundred (600) sheep ovaries were used in each season (winter: November to February, summer: March to June and rainy: July to October Surface follicles visible to the naked eye were recorded with the help of digital vernier caliper and classified into three groups depending on their diameter: small (<2 mm), medium (2-4 mm) and large (>4 mm) (Dar, 2014) [5]. Statistical analysis was done by software (I.B.M, SPSS version 16.0). Difference were considered to be significant at P<0.05.

Results and Discussion
The number (mean± SE) of small, medium, large size and total surface follicles were recorded 3.05±0.02, 2.43 ± 0.02, 1.68 ± 0.02, 7.16±0.03 during winter, 2.30 ± 0.02, 1.79 ± 0.02, 1.23 ± 0.01, 5.34±0.02 during summer and 2.79 ± 0.03, 2.25 ± 0.02, 1.56 ± 0.02, 6.62±0.03 during rainy season, respectively (Table 1).
The number (mean ± SE) of small, medium, large size and total surface follicles in each ovary was significantly high (P<0.05) in winter and significantly lower in summer compared to other season. The number (mean ± SE) of small surface follicles were significantly high (P<0.05) in all the three seasons.
The present findings are in concurrence with the studies of (Ali *et al.*, 2006) [1] in sheep and (Dar, 2014) [5] in goat who observed significantly higher (P<0.05) surface follicles in winter

season with a significantly higher (P<0.05) number of small and medium size follicles in winter season (Dar, 2014) [5]. Significantly higher growing follicles were observed in buffalo (Sasan *et al.*, 2015) [12].

Results of above findings point out that rate of follicular development are higher in winter as compared to summer. The ovarian folliculogenesis is adversely affected by the extreme environmental temperature (Rensis and Scaramuzzi, 2003) [10] and rate of follicular development (Bari *et al*., 2011) [2] with decreased steroidogenesis within thecal cells or granulose cells or both (Kanai *et al*., 1995) [6] (Wolfenson *et al*., 1997) [15] (Wilson *et al*., 1998) [14] resulting in degeneration and atresia (Roth *et al*., 2000) [11].

However many studies have shown the number of follicles didn't differ significantly among seasons (Noel *et al.*, 1993) [9] in sheep and follicular activity remains normal during the seasonal anestrus period (Cruz *et al*., 2005) [4] in goats. Cahill and Mouleon (1980) [3] observed similar total number of normal follicles with >3 layers of granulosa cells with significantly more antral follicles >1 mm diameter but the mean numbers of preovulatory-sized follicles (>5mm diam.) were similar in the anoestrus and breeding seasons (Mc Natty *et al.*, 1984) [8]. They concluded that the levels of antral follicular activity changes throughout the year in synchrony with the circannual patterns of prolactin and day length in ewes.

Table 1: Mean number of small, medium and large size and total surface follicles in sheep ovaries during winter, summer and rainy season

S. No.	Season	No. of ovaries	Total no. of follicles	Follicle size			
				Small surface follicles	Medium surface follicles	Large surface follicles	Total surface follicles
1	Winter	600	4297	3.05 ± 0.02^{cC} (42.59%)	2.43 ± 0.02^{cB} (33.95%)	1.68 ± 0.02^{cA} (23.46%)	7.16 ± 0.03^{c}
2	Summer	600	3203	2.30 ± 0.02^{aC} (43.21%)	1.79 ± 0.02^{aB} (33.69%)	1.23 ± 0.01^{aA} (23.10%)	5.34 ± 0.02^{a}
3	Rainy	600	3970	2.79 ± 0.03^{bC} (44.22%)	2.25 ± 0.02^{bB} (34.13%)	1.56 ± 0.02^{bA} (23.65%)	6.62 ± 0.03^{b}
Overall		1800	11470	2.71 ± 0.02^{C} (42.63%)	2.16 ± 0.01^{B} (33.94%)	1.49 ± 0.01^{A} (23.43%)	6.37 ± 0.02

Means with superscripts a, b, c in the column vary significantly at P<0.05
Means with superscripts A, B, C differ significantly row-wise at P<0.05
Figures in bracket show percentage

Conclusion

It was concluded from present study that among the three seasons, number of small, medium, large size follicles and also total surface follicles in each ovary of sheep was significantly high (P<0.05) in winter season compared to summer and rainy season.

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