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Influence of different stages of corpus luteum on ovary size, oocytes grades and follicular population in Indian buffaloes

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Abstract**—** *The aim of this study was to evaluate the effect of different stages of corpus luteum on ovary size, oocytes grades and follicular population. A total of 109 buffalo ovaries were collected from the slaughterhouse and transported to the laboratory for determination of ovaries weight, length, width, thickness, follicular population and oocytes grades. The results obtained revealed that the effect of types of CL on ovary weight and size showed a significant difference in the type of CL groups with ovary weight and ovary size. Ovaries having CL in late-stage showed the highest mean of ovary weight, length, width and thickness over the CL in the early and middle stage. Moreover, the results showed no significantly different in the type of CL groups with follicular population and oocytes grades.*

Keywords**— *Buffalo, Ovary, Corpus luteum, Follicular population, oocytes grades.***

I. INTRODUCTION

Corpus luteum (CL) is an endocrine gland formed after ovulation of graffian follicle and contributes to regulate estrous cycle and maintenance of pregnancy (Schams and Berisha, 2004). In different stages of estrus cycle and pregnancy, corpus luteum has several stages in size and structure (fields and fields, 1996). Corpus luteum synthesizes and secretes hormones such as progesterone, estrogen, relaxin, oxytocin, vasopressin and inhibin (Fields, 1991). Progesterone is essential steroid hormone necessary for establishing of pregnancy in domestic animals (Tomac *et al*., 2011). Moreover, blood progesterone has useful tool to determine an appropriate time of insemination, monitoring of cyclicity and pregnancy diagnosis in buffaloes (Batra and Pandey, 1983) .The aim of the current study was to evaluate the effect of different stages of corpus luteum on ovary size, oocytes grades and follicular population.

II. MATERIALS AND METHODS

2.1 Study area:

The present research was conducted in year 2018 – 2019 at Central Institute for Research on Buffalo, Hisar Haryana, India, located between Latitude: 29°09′14″ N Longitude: 75°43′22″ E and Elevation above sea level: 216 m.

2.2 Experiment design

One hundred nine buffalo ovaries having CL were collected immediately after slaughtering from Delhi slaughterhouse and transported to the laboratory in an insulated container containing normal saline with antibiotics. In laboratory, all tissues attached to ovaries were removed and all ovaries were washed twice in saline solution containing antibiotics (Dharmendra *et al*., 2011). After wash all ovaries were classified into three groups: Group having CL in early stage, middle stage and late stage.

2.2.1 Determination of ovaries weights:

Ovaries were weighed by using an electronic scale balance and expressed in gram (Kouamo *et al*., 2014).

2.2.2 Determination of ovaries lengths:

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Ovaries lengths were measured using electronic Vernier calipers as the distance from anterior pole to posterior pole and expressed in cm (Samad and Raza, 1999).

2.2.3 Determination of ovaries widths:

Ovaries widths were measured using electronic Vernier calipers as the greater distance from the medial to the lateral surfaces and expressed in cm (Bukar *et al*., 2006).

2.2.4 Determination of ovaries thicknesses:

Ovaries thicknesses were measured using electronic Vernier calipers as greatest distance along an axis vertical to the longitudinal axis and expressed in cm (Razzaque *et al*., 2008).

2.2.5 Determination of follicular population:

For each ovary, visible follicles were counted and follicle size was measured with electronic Vernier calipers. Follicles were classified into 3 categories: small (<3 mm), medium (3 to 8 mm) and large (> 8 mm) (Baki Acar *et al*., 2013).

2.2.6 Oocytes collection:

Oocytes were collected by aspiration of surface follicles (2–8 mm diameter) using 18-gauge disposable needle attached to a 10 ml syringe in aspiration medium. The follicular fluid was collected in tube and kept for 15 minutes. The sediment was collected in 60 mm Petri dish and oocytes were searched under stereo zoom microscope.

2.2.7 Grading of Oocytes:

Oocytes were graded as: A, B, C and D according to homogenous of ooplasm and cumulus cells layer.

III. STATISTICAL ANALYSIS

Data were analyzed using SPSS (Statistical Package for Social Sciences) Version 18. The analysis of variance and Duncan's test statistics were used to analyze appropriate data sets. Differences were significant at $P < 0.05$.

IV. RESULTS AND DISCUSSION

The effect of types of CL on ovary weight and size is presented in table 1. The results showed significantly difference ($P<0.05$) in type of CL groups with ovary weight and ovary size. Ovaries having CL in late stage showed highest mean of ovary weight (5.03±0.17), length (2.35±0.05), width (1.74±0.05) and thickness (1.48±0.03) over the CL in early and middle stage. The mean weight, length, width, thickness were significantly higher in ovaries having CL in late stage as compared with ovaries having CL in early and middle stages. This result may occur due to hyperplasty of fibroblast of the connective tissue and vascularity contributes to an increase in size of the CL (Jablonka-Shariff *et al*., 1993).

The effect of types of CL on follicular population is presented in table 2. The results showed no significant difference between type of CL and follicular population. May be due to progesterone mechanism which inhibits follicular growth through suppression of LH which is critical for continued growth to large follicles (Bartlewski *et al*., 2001). Campbell *et al* (1991) reported that the CL secreted inhibin hormone into ovarian venous blood which has widely affect on ovarian follicular growth. These results were different than that found by (Mervat and Marwa, 2019) in cow. This difference might be due to animal and environment.

The effect of type of CL on oocyte grades is presented in table 3. The results showed no significant difference between type of CL and oocyte grades.

Table -1 Means (± SE) values of early, middle and late stage of CL:

			Ovary size			
Factors		**No. of ovary**	**Weight**	**Length**	**Width**	**Thickness**
	Early CL	26	3.38±0.24^{c}	2.09±0.09^{c}	1.41±0.06^{c}	1.20±0.02^{c}
	Middle CL	23	4.03±0.24^{b}	2.14±0.09^{b}	1.54±0.06^{b}	1.47±0.04^{b}
	Late CL	60	5.03±0.17^{a}	2.35±0.05^{a}	1.74±0.05^{a}	1.48±0.03^{a}
CL	**P < 0.05**	-	**.000**	**.015**	**.000**	**.000**

a,b,c In each column different letters (a, b) indicated significant difference between group ($p<0.05$ No =number SE = Standard Error CL = corpus leutum

Table -2 Means (± SE) values of early, middle and late stage of CL:

			Number of follicles			
Factors		**No. of ovary**	**Small**	**Medium**	**Large**	**Average No**
	Early CL	26	1.46±0.30	0.46±0.16	0.31±0.11	2.23±0.29
	Middle CL	23	1.13±0.29	0.61±0.18	0.26±0.14	2.00±0.35
	Late CL	60	1.22±0.18	0.52±0.13	0.28±0.06	2.02±0.20
CL	**P < 0.05**	-	**.690**	**.858**	**.957**	**.821**

No =number SE = Standard Error CL = corpus leutum

Table -3 Means (± SE) values of early, middle and late stage of CL

			Oocytes grades				
Factors		**No. of ovary**	**I**	**II**	**III**	**IV**	**Selected oocytes for IVEP. I and II**
	Early CL	26	0.23±0.20	0.46±0.34	0.50±0.46	0.12±0.12	0.69±0.53
	Middle CL	23	0.39±0.27	0.52±0.38	0.35±0.27	0.09±0.09	0.91±0.64
	Late CL	60	0.20±0.15	0.35±0.25	0.78±0.65	0.0	0.55±0.39
CL	**P < 0.05**	-	**.791**	**.920**	**.890**	**.295**	**.880**

No=number SE = Standard Error CL = corpus leutum

V. CONCLUSION

From the present study, it is concluded that the highest ovary weight and size in ovaries with CL in late stage than others stages. So, the corpus luteum has a great effect on ovarian morphology without having effect on oocyte grades and follicular population in buffaloes.

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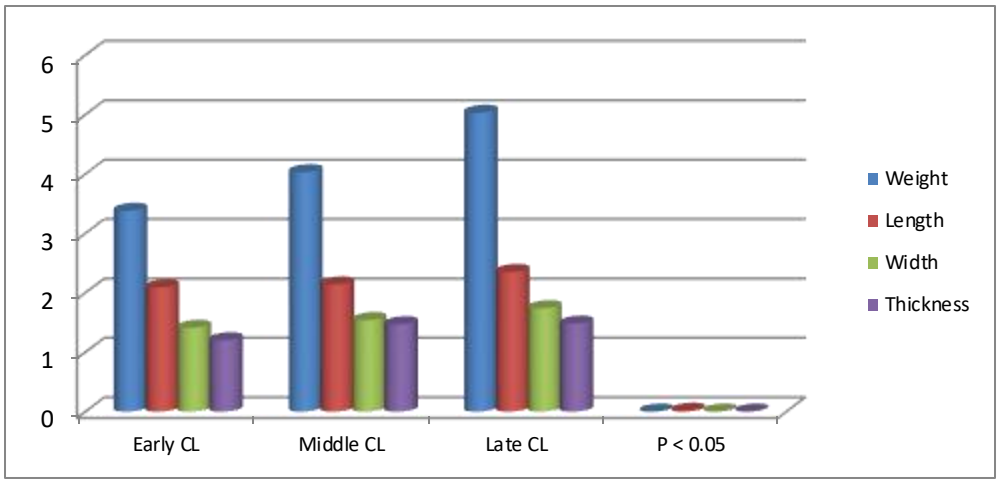
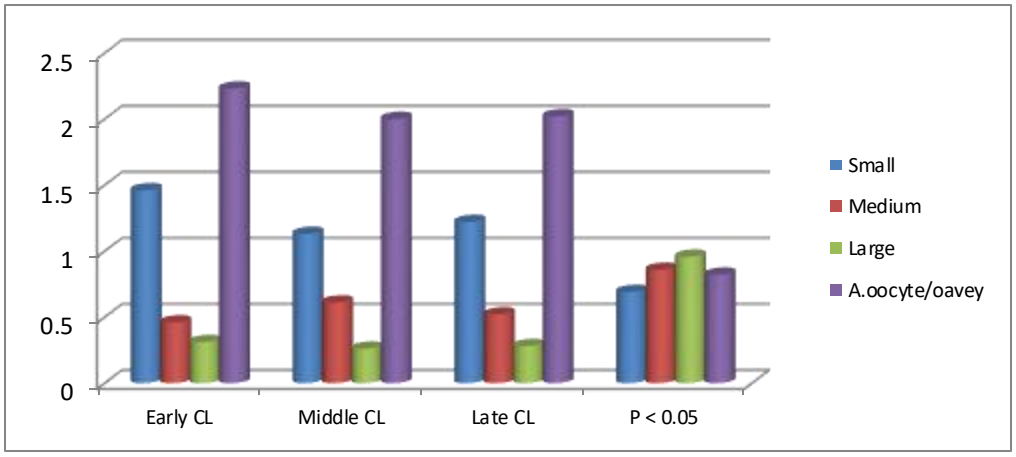
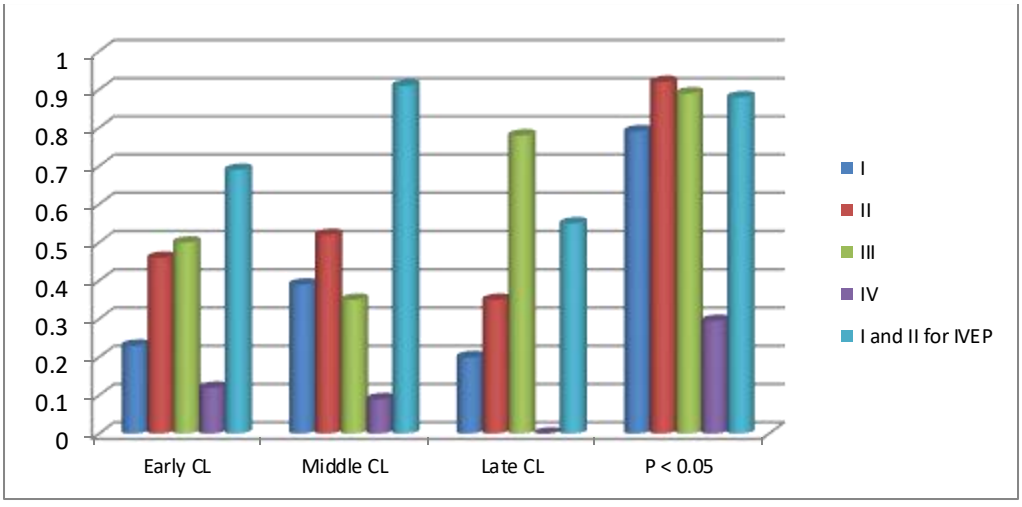


Relationship between types of CL, ovary weight and ovary size



Relationship between types of CL and follicular population



Relationship between types of CL and oocytes grades