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Number of Ovulation Observed in Black Bengal Goats by Ultrasound Imaging and its Subsequent Confirmation through Exploratory Laparotomy

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ABSTRACT

The study was conducted in female Black Bengal goat to investigate the number of ovulation during gestation period by Ultrasound Image (USG). Female kids of three months of age were placed in three groups with five numbers in each group; 1st TG with supplementary nutrition and a buck, 2nd TG with supplementary nutrition and 3rd TG as control. Due to permanent exposure of buck and good plane of nutrition, the animals under TG 1 attained puberty significantly (P<0.01) earlier than other two groups. Average body weight of animals of TG1 (10.0 kg) was also recorded to be lowest. Most failure of conception was noted in TG 1 as reflected by its significantly higher (P<0.05) number of services (3.6) than other two groups (2.2 and 2.0 respectively). Highly significant (P<0.01) variation in respect to age of 1st kidding was observed, the animals under TG 1 took least time, but body weight of animals of TG 3 was least. Post-partum estrus was also recorded to be earliest (3 to 6 weeks) in first group of animals than the other two. By ultrasound imaging technique a single number of *Corpora lutea* (CL) was counted for individual animal under different treatment group on the 11th day of oestrus cycle, with an exception of three CL in one animal of the first treatment group. Out of total 17 CL counted, 11 were found on the left ovary. Number of ovulation observes by ultrasound imaging, was confirmed through laparotomy.

HIGHLIGHTS

- Total number of ovulations was confirmed by ultrasound imaging.
- Ultrasound imaging is a best technique to confirm exact number of ovulations without surgical interventions.

Keywords: Ultrasound, Laparotomy, Prolificacy, Goat

Over thousand years, goats have been utilized for their milk, meat, and hair and skin production all over the world. In India, goats are generally reared by small and marginal farmers and land less labourers with minimum or without any investment. Black Bengal goats are found in West Bengal, north-eastern part of India and Bangladesh. A new field ultrasonography has been opened, and surely successful outcome will be forthcoming in the next years to improve reproductive management of the goat, the fastest growing ruminant population in the world (Rubianes and Menchaca, 2003). The understanding of the dynamics and regulation of follicle development in the goat has increased in recent years due to the use of ultrasonography. Previous findings observed in other ruminants extend to this species such as: the wavelike pattern of follicular growth with waves emerging every 5-7 days; the presence of follicular dominance, particularly during wave 1 and the ovulatory wave; and the role of progesterone concentrations on follicular wave turnover (Rubianes and Menchaca, 2003).

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MATERIALS AND METHODS

The experiment was conducted in Completely Randomized Design (CRD) with three treatments, viz. (i) Nutritional Effect and buck effect, (ii) Nutritional effect and (iii) Control. There were five female Black Bengal kids of three months of age in each group. The first group of animals was allowed to graze *ad lib* and the only were kept with a buck while the other two groups of animals were stall fed with the similar type of grass *ad lib*. The animals of TG-1 and TG-2 were also provided with concentrate feed supplement (21% CP) @ 10g per kg body weight per day in two divided doses. The animals under control group were neither provided the concentrate feed mixture nor kept with the buck. All the animals were placed in comfortable sheds and were under standard management practices. The data were analysed statistically by the analysis of variance (ANOVA) method, described by Cochroan and Cox (1967) and Panse and Sukhatme (1967). Error mean square by Fisher and Snedecor's F-test method was followed to test significance of different sources of variation. The standard error (S_e) and test of significance have been provided in the tables of results to compare the mean values. Ultrasonography was done by - Digital Ultrasound Imaging System (CTS-900V) made by Shantou Institute of Ultrasonic Instruments (SIUI), China. The procedure for laparotomy was followed as per the standard protocol by O'Connor, J. J. (edt), Dollar's Veterinary Surgery, 4th edition.

RESULTS AND DISCUSSION

Observation of number of ovulation by Ultrasound imaging

Transrectal ultrasound imaging is an important technique for detection of ovulation in small ruminants, which provides a means for repeated, direct non-invasive monitoring of ovarian structures. It is also useful to detect pregnancy as early as 20-25 days post-mating. It can also help in monitoring of embryonic development, transfer implantation, feto-maternal relationship as well as foetal growth and placentation. Real-time imaging systems can help in diagnosis of reproductive disorders. It is powerful tool for studying ovarian physiology (Vinoles *et al*., 2004).

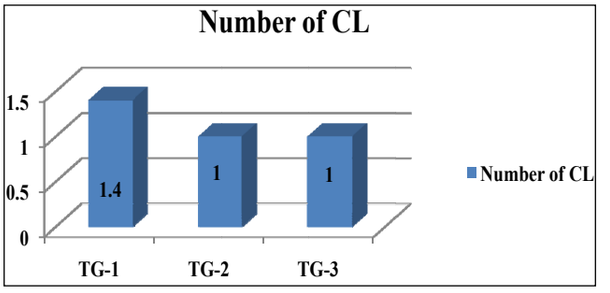

Fig. 1: Average number of *Corpora lutea* on the ovary of female under different treatments observed through ultrasonography. [X-axis represents different treatment groups and Y-axis represents number of CL]

Table 1: Number of *Corpora lutea* on the ovary of female under different treatments observed through ultrasonography

Animal number in respective treatment group	Number of *corpora lutea* on the ovary of female observed through ultrasonography					
	TG-1*		TG-2*		TG-3*	
	Left ovary	Right ovary	Left ovary	Right ovary	Left ovary	Right ovary
1	1	0	1	0	0	1
2	1	0	0	1	0	1
3	1	0	0	1	1	0
4	1	0	1	0	1	0
5	2	1	1	0	0	1
Mean	1.40		1.0		1.0	

TG-1* = nutrition and buck effect; TG-2* = nutrition; TG-3* = control (without nutrition and buck effect)

Transrectal Ultrasound imaging was performed to observe the number of corpora lutea (CL) on the ovaries of the animals of three treatment groups on the eleventh day of estrous cycle, when the CL were most prominent (Patra, 2014). It was evident from the present study that, the average number of CL on the ovaries of the animals under first, second and third treatment groups were 1.40, 1.0 and 1.0, respectively (Table 1 and Fig. 1). Number of CL found on left ovary of the first group of animals was 1 from each of the four animals (Fig. 2 and Fig. 4) and 2 from the fifth one (Fig. 3 and 4), whereas, one CL was found from right ovary only from the fifth animal. One CL from each of the three animals on the left ovary and each of the rest two animals on the right ovary was observed through ultrasonography of ovaries of the animals under the second group. For animals of the third treatment group, one CL from each of two animals on left ovary and one CL from each of rest three animals on right ovary were detected. Out of total seventeen CL counted, eleven were found from left ovary and rest six from right ovary (Table 1 and Fig. 5). The present data was supported by the observation of CL through ultrasonography and laparotomy of the Black Bengal goat under NFBSFARA project (Annual Report NFBSFARA-2011-2012) where more than 50 percent ovulation was from left ovary.

The observations of the present study corroborated with the findings of the previous workers regarding the procedure and observation through transrectal ultrasound imaging technique. Transrectal ultrasound examination was performed in ewes in dorsal recumbancy or in standing position, using 7.5 MHz transducer to know the number

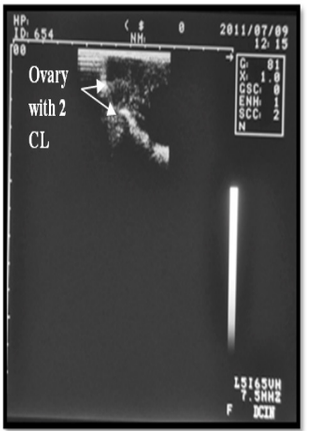

Fig. 2: TG-1, Ovary with two CL

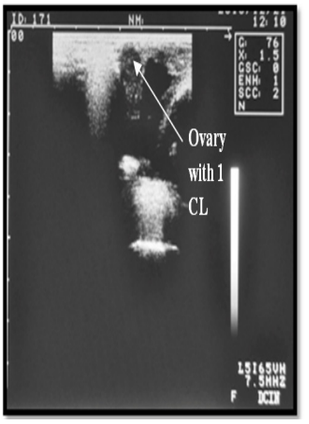

Fig. 3: TG-2, Ovary with one CL

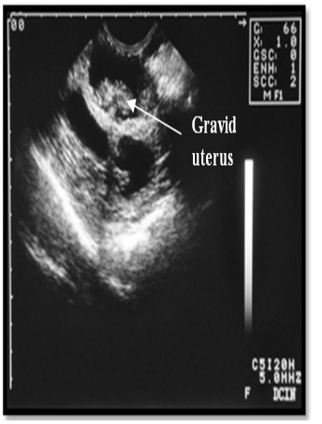

Fig. 4: TG-3, Gravid uterus

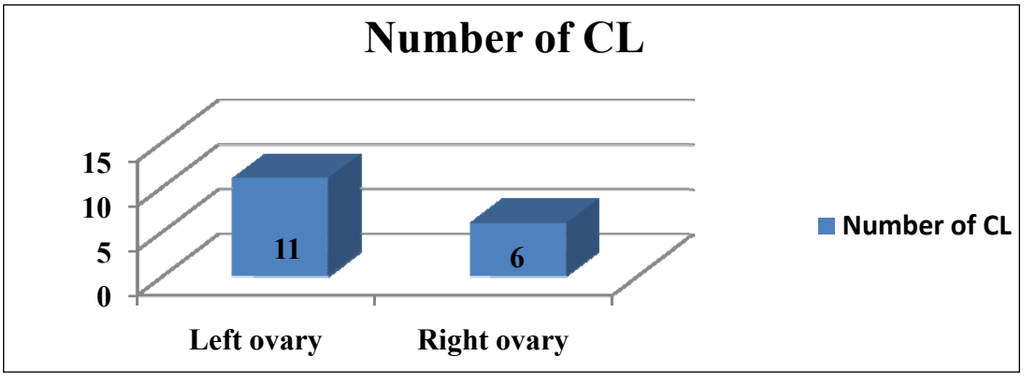

Fig. 5: Total number of CL on left and right ovaries of all the experimental animals. [X-axis represents ovaries and Y-axis represents number of CL]

Table 2: Number of *Corpora lutea* on the ovary of female under different treatments examined through laparotomy

Animal number in respective treatment group	Number of *corpora lutea* on the ovary of female examined through laparotomy					
	TG-1*		TG-2*		TG-3*	
	Left ovary	Right ovary	Left ovary	Right ovary	Left ovary	Right ovary
1	1	0	1	0	0	1
2	1	0	0	1	0	1
3	1	0	0	1	1	0
4	1	0	1	0	1	0
5	2	1	1	0	0	1
Mean	**1.40**		**1.0**		**1.0**	

TG-1*= nutrition and buck effect; TG-2*= nutrition; TG-3*= control (no nutrition and buck).

Laparoscopic Images

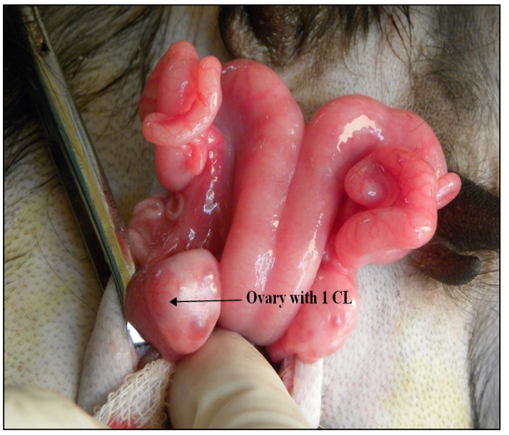

Fig. 6: Genital tract along with both ovaries showing CL and follicles

Fig. 7: Genital tract along with both ovaries showing CL and follicles

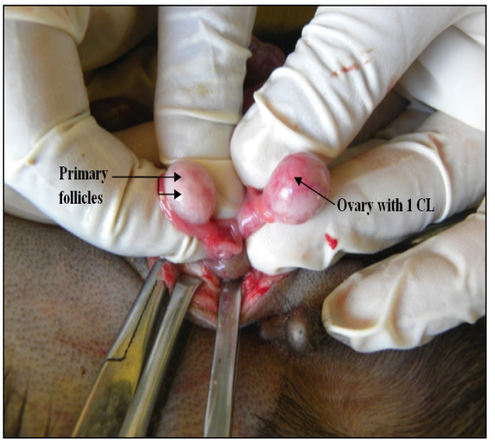

Fig. 8: Left Ovary with one CL and right ovary with several small follicles

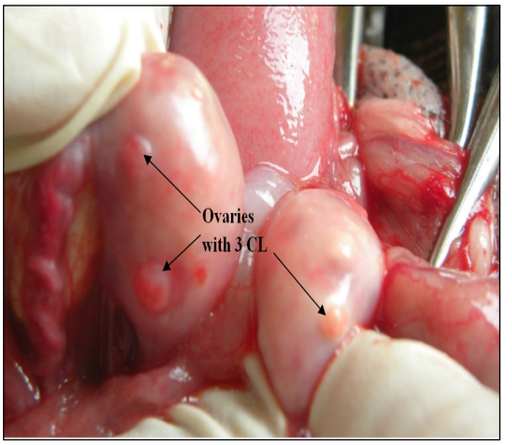

Fig. 9: Left ovary with two CL and right ovary with one CL

of CL on the ovaries which was an accurate method of evaluation of CL (Patra, 2014). On the tenth day of estrous cycle, CL was well developed and could be scanned by this procedure.

Observation of number of ovulation through exploratory laparotomy

A laparotomy is a surgical procedure involving a large incision through the abdominal wall to gain access into the abdominal cavity. Laparotomy is of two types, namely, exploratory laparotomy and therapeutic laparotomy. In exploratory laparotomy or diagnostic laparotomy (abbreviated as ex-lap), the internal abdominal and lower abdominal structures are observed thoroughly.

Exploratory laparotomy was performed to know the actual number of *corpora lutea* (CL), which represented the number of ovulation and eventually the number of kids will born, on the ovary of the animals under experimentation. This particular experiment was performed after ultrasound imaging on the eleventh day of estrous after doing ultrasonography, when the CL were prominent, which were supported by earlier workers (Veronesi *et al.* 2002; Vinoles *et al.* 2004). From the present study, it was found that the number of CL, examined through laparotomy were same as found by ultrasonography (Table 1 and 2). As all the animals were in first parity, most of them had one CL on the ovary (Fig. 6 and 7), with an exception in one animal of the first group of treatment. It had been examined that three CL were present of that particular animal, two on the left and one on the right ovary (Fig. 8 and 9). As the animals of the first treatment group were given good plane of nutrition, the animal could successfully carry the pregnancy and terminated into successful kidding in spite of having three ovulations.

CONCLUSION

By ultrasound imaging technique, a single number of CL was counted for each animal under each treatment group on the 11^{th} day of estrous, with an exception of three CL in one animal of the first treatment group. Out of total 17 CL counted, 11 were found on the left ovary. Exploratory laparotomy was conducted on the same day, and the numbers of CL were found to be same, as seen by ultrasound imaging.

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REFERENCES

Annual Report. 2012. Project title: Endocrine profiles and characterization of candidate genes influencing prolificacy in black Bengal goat. *NFBSFARA*.

Boyd, J.S. and Omran, S.N. 1991. Diagnostic ultrasonography of the bovine female reproductive tract. *In Practice. BVA Pub.*, **45**(1): 109-118.

Gracia, A., Van Der Weijden, G.C., Colenbrander, B., Bevers, M.M. 1999. Monitoring follicular development in cattle by real-time ultrasonography: a review. *Vet. Rec.,* **145**: 334-340.

Haldar, A., Paul, R., Pan, S., Mitra, A., Biswas, C., Majumdar, D., Ghosh, S., Singha, N.P., Ngachan, S.V., Bajurbhoruea, K.M. and Prakash. B.S. 2009. Validation of a simple, sensitive enzyme immunoassay (EIA) for the determination of caprine plasma LH. *Small Rum. Res.,* **84**: 22–27.

Medan, M.S., Watanabe, G., Sasaki, K., Nagura, Y., Sakaime, H., Fujita, M., Sharawy, S. and Taya, K. 2003. Ovarian and hormonal response of female goats to active immunization against inhibin. *J. Endocrinol.*, **177**: 287-294.

Pan, S., Biswas, C.K., Majumdar, D., Sengupta, D., Patra, A., Ghosh, S. and Haldar, A. 2014. Influence of age, body weight, parity and morphometric traits on litter size in prolific Black Bengal goats. *J. Appl. Anim. Res.,* **43**(1): 104-111.

Patra, A. 2014. Regulation of reproduction in female Black Bengal goat in relation to its prolificacy by different non-hormonal factors. A Thesis submitted to the *Department of Animal Science*, *BCKV*. Mohanpur, Nadia, India.

Pierson, R.A. and Ginther, O.J. 1987. Reliability of diagnostic ultrasonography for identification and measurement of follicle and detecting the corpus luteum in heifers. *Theriogenology,* **28**: 926-936.

Rubianes, E. and Menchaca, A. 2003. The pattern and manipulation of ovarian follicular growth in goats. *Anim. Repro. Sci.,* **78**: 271-287.

Schrick, F.N., Surface, R.A., Pritchard, J.Y., Dailey, R.A., Townsend, E.C. and Inskeep, E.K. 1993. Ovarian structures during the estrous cycle and early pregnancy in ewes. *Biol. Reprod.,* **49**: 1133-1140.

Veronesi, M.C., Gabai, G., Battocchio, M., Mollo, A., Soldano, F., Bono, G. and Cairoli, F. 2002. Ultrasonographic appearance of tissue is a better indicator of CL function than CL diameter measurement in dairy cows. *Theriogenology,* **58**: 61-68.

Vinoles, C., Meikle, A. and Forsberg, M. 2004. Accuracy of evaluation of ovarian structures by transrectal ultrasonography in ewes. *Anim. Reprod. Sci.,* **80**: 69-79.