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Real Time Ultrasonography for Determining Viable Foetal Numbers in Goats

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ABSTRACT

Twenty-five (25) does in dorsal recumbency were scanned by 3.5 MHz transabdominal sector transducer. Each doe was scanned separately by tilting the doe in right and left side. All the animals were scanned twice between 37-119 days post breeding. One goat showed foetal resorption on its second scan so only 24 goats were considered for calculation of litter size. There was non-significant difference (P = 0.7427, t 0.01 =0.332) between actual and sonographically observed values of litter size and the correlation coefficient between the two was 0.725 (P< 0.01) which is positive and highly significant. The accuracy of detecting single fetus was 83.33% (10/12); twins was 80% (8/10) and triplets was 50% (1/2). In total 37 kids were born viz 12 singles, 11 twins and 1 triplet to 24 goats. The average actual litter size of goats was 1.54±0.120 kids while as by ultrasound it was 1.6 ± 0.129. It was concluded that real-time transabdominal ultrasonography is accurate and practical method for predicting foetal numbers and foetal viability in goats.

Keywords: Ultrasonography, reproduction, viable, foetal numbers, goats

Goat rearing has been recommended as the best choice for the rural- people in the developing countries like India because of their wider adaptability, high fertility and fecundity, moderate feeding and management needs, high feed conversion ratio, quick pay off and low risk involved. India possesses the largest goat population (124.358 Million) and ranks first in the world (17th Indian live stock census, 2003). In intensive goat management feeding costs can be cut down if the litter size can be judged in advance. Pre-partum grouping of does according to gestational stage and litter size can optimize kidding management.

Early diagnosis of pregnancy and the determination of litter size are of considerable value in improving efficiency of reproduction in goats. Accurate pregnancy diagnosis may provide essential information for effective herd management practices (Doize *et al.* 1997). Real time B mode ultrasonography is a non-invasive, accurate and rapid alternative for pregnancy diagnosis and studying the development of the conceptus in livestock. There are many reports regarding transcutaneous and transabdominal ultrasonography in sheep, but there is a paucity of information on the suitability of this technique for use in goats (Padilla-Rivas *et al.* 2005).

The best period for counting the number of fetuses has been reported to be from the 5th to 7th week of gestation. Ultrasonic imaging of the heart beat is generally also used to detect the embryo and to evaluate the embryo viability and confirm pregnancy (Suguna *et al.* 2008). Heart beat has been detected on days 21–24 of pregnancy

(Doize *et al.* 1997; Martinez *et al.* 1998; Mohammed. *et al.* 2004; Padilla-Rivas *et al.* 2005; Suguna *et al.* 2008) by transrectal ultrasonography and using the transabdominal approach by days 27–35 in goats (Hesselink and Taverne, 1994; Dawson *et al.* 1994; Padilla-Rivas *et al.* 2005; Suguna *et al.* 2008).

Keeping in view the importance of ultrasound in diagnostic and developmental studies in goats, the present study was planned to determine the litter size and to evaluate the accuracy of diagnosis of litter size by ultrasound in goats.

MATERIALS AND METHODS

Animals

A total of 25 does were found pregnant by Ultrasonographic scanning and were selected for study. The animals were kept under optimum management system.

Ultrasonographic examination

A real time, B mode, portable ultrasonographic machine (SD – 500, Aloka Co. Ltd., Japan) with 3.5 MHz transabdominal sector transducer was used for scanning of the uterus. The selected animals needed no special preparation except does which had long hairs need shaving of area cranial to udder. Sometimes in advanced gestation clipping of hair cranial to udder was carried out to get better image. All the does were scanned in dorsal recumbency. Each horn was scanned separately by tilting the does to right and left side. In late gestation it was sometimes helpful to manually push the abdomen towards the transducer to get the uterus within range of transducer as reported by (Haibel, 1990; Kahn, 1992). An abundant ultrasound coupling gel was smeared on abdomen and on probe to increase the conductivity of ultrasound waves and to avoid clipping of hair.

Litters size estimation

In this study, 60 does were scanned for pregnancy diagnosis and 25 were found to be pregnant. In all 25 does, during first and second scanning litter size was estimated. The does were considered carrying multiple foetuses when multiple heads and\or spines and\or rib cages and \or multiple heart beats or entire multiple foetuses were seen on the same screen. After kidding actual litter size was compared with ultrasonographically estimated litter size and accuracy of ultrasonography was calculated by formula (Number of animals with litter size confirmed after kidding Number of animals with litter size diagnosed by ultrasonography) multiplied by 100.

Statistical analysis

The data obtained from various trials under experiment was subjected to statistical analysis. Means and standard error were calculated following the standard statistical procedures. The two tailed t' test at 0.01 and the correlation coefficient ($p<0.01$) were calculated at appropriate level of significance for a pair-wise comparison of data.

RESULTS AND DISCUSSION

Sonographic evaluation of litter size

All 25 does were scanned in dorsal recumbency for estimation of litter size. Each horn was scanned separately by tilting the does in right and left sides. The summary of litter size is given in Table 1.

It took almost 2 to 3 minutes to scan a doe for evaluation of litter size. Does in advanced stage of gestation needed extra time as shadowing caused by the bones of developing foetus makes it difficult to detect number of foetuses and also the foetuses were deep in the abdominal cavity to be visualized. (Fowler and Wilkins 1984; Agrawal and Geol, 1992; Dawson, 1999; Harwood and Matthews, 2006; Keith and Ken, 2006) reported that it is difficult to differentiate twins and triplets or quadruplets at any stage of gestation. The observations corroborated well with the finding of present study. However Padilla-Rivas *et al.* (2005) stated that the best time to distinguish between single and twin foetuses with a 7.5 MHz rectal probe was between the 28th and the 40th day of pregnancy. This could be attributed to use of transrectal ultrasonography.

Each doe was scanned in dorsal recumbency for estimation of litter size. In one doe foetal resorption was observed during second scan for taking fetal

Table 1. Comparison of litter sizes seen through ultrasonography and actual litter size observed after parturation

No. of animals	Litter size by USG±SEM	Actual litter size ± SEM	Accuracy for singles	Accuracy for twins	Accuracy for triplets
12	1.6 ± 0.29	1.542 ± 0.120	83.33%	80%	50%

SEM = Standard Error for Mean.

Accuracy = Number of correctly diagnosed does /Total does scanned (percentage).

measurements. Therefore for calculation of litter size only 24 observations were considered. The foetal number detected by ultrasonography was compared to the actual number of kids born.12 does were diagnosed carrying single foetuses, 10 were diagnosed carrying twins and two does were diagnosed carrying triplets on ultrasonographic examination. Out of 12 does diagnosed carrying single foetuses 10 were diagnosed correctly while two does gave birth to twins. Out of 11 does diagnosed carrying twins eight were diagnosed correctly while two gave birth to only one kid and one gave birth to triplet. Out of two does diagnosed with triplets one doe was diagnosed correctly and other one gave birth to twins. In total there were 12 singles, 11 twins and 1 triplet born. Foetal number was detected any time between 37 and 119 days but the best time was somewhat between 40 to 50 days as in this period one triplet was correctly diagnosed. These observations corroborated with (Buckrell, 1988; Scott *et al*, 2001; Keith and Ken, 2006; Suguna *et al* 2008.). The average litter size of the goats by ultrasonographic examination was 1.6 ± 0.29 kids while as actual litter size was 1.54 ± 0.120 kids. This result of the present study corroborated with those of Basaran, 1999.

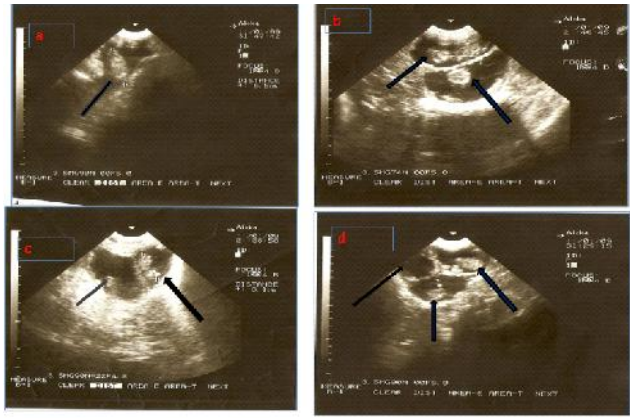

Fig. 1. Typical images observed by transabdominal real time ultrasonography with a 3.5 MHz sector transducer, the foetuses are shown by black arrows as a distinct echo dense structures within the uterine lumen (a) single foetus (b and c) twin foetuses and (d) triplet foetuses.

Accuracy of detecting single foetuses was 83.33% (10/12); the accuracy of detecting twins was 80.00% (8/10). The accuracy of detecting triplets was 50% (1/2). The observations corroborated with those reported by (Fowler and Wilkins, 1984a; Taverne *et al.* 1985; Logue *et al.* 1987; Zipper *et al*.1997; Parraguez *et al.* 1999; Harwood and Matthews, 2006; Abdelghafar *et al.* 2007) while (Restall *et al.* 1990; Dawson, 1999; Arthur *et al.* 2001) reported lower accuracy of detecting litter size than the present study which could be attributed use of 3.5MHz probe by transabdominal approach in the present study and operator variation based on experience and skill. Higher accuracy was reported by (White *et al.* 1984; Taverne *et al.* 1985; Gearhart *et al.* 1988; Dawson *et al.* 1994; Aly-Karen, 2003; Mohamed-Mohammed. *et al.* 2004; Stephan, 2007), because of different types of approaches- as dorsal vs. standing, types of probes (3.5, 5.0 and 7.5MHz), clipping vs. non clipping of hairs, fasting vs. non fasting and stage . The present work was carried out under field conditions where clipping of hair and fasting of does was not possible. Which might have contributed to lower accuracy than reported by these along with operators variation. It was observed that litter size observed ultrasonography was comparable with the actual litter size and the difference was statistically non-significant ($p = 0.7427$, $t\ 0.01 = 0.332$). The correlation coefficient between actual litter size and size predicted by ultrasonography was found to be 0.7254 which was positive and highly significant ($p<0.01$).

CONCLUSION

The average litter size of the goats by ultrasonographic examination was 1.6 ± 129 kids while as actual litter size was 1.54 ± 0.120 kids. Each doe was scanned in dorsal recumbency for estimation of litter size. The foetal number detected by ultrasonography was compared to the actual number of kids born (12singles, 11 twins and 1 triplet) at delivery. Foetal number was detected any time between 37 and 119th day of gestation but the best time was somewhat between 40 to 50 days as during this period one triplet was diagnosed correctively. Accuracy of detecting single foetus was 83.33% (10/12); the accuracy of detecting twins was 80.00% (8/10). The accuracy of detecting triplets was 50% (1/2), out of 2 cases only one case was correctly diagnosed as bearing triplets.

REFERENCES

Abdelghafar, R.M., Bakhiet, A.O. and Ahmed, B.H. 2007. B-mode Real-Time ultrasonography for pregnancy diagnosis and fetal number in Saanen goats. *J. Anim. Vet. Adv.*, **6**(5): 702-705.

Agrawal, K.P and. Goel, A.K. 1992. A review of pregnancy diagnosis techniques in sheep and goats. *Small. Rumin. Res.*, **9**: 255-264.

Aly-Karen., Kovacs, P., Beckers, J. F. and Szenci, O. 2003. Pregnancy diagnosis in sheep: Review of the most practical methods. *Acta. Vet.,* **70:** 115-26.

Arthur, G.H., Noakes, D.E., Parkinson, T.J and England, G.C.W (2001), *Arthurs Veterinary reproduction and Obstetrics.* **8**: 335 -338.

Basaran, A.K. 1999. Diagnosis of ovulation rate and embriyonal foetal development by transrectal ultrasonography in the White goats. *Turk. J. Vet. Anim. Sci.*, **23**: 567-573.

Buckrell, B.C. 1988. Applications of ultrasonography in reproduction in sheep and goats. *Theriogenology*. **29**: 71-84.

Dawson, L.J., Sahlu, T., Hart, S.P., Detweiler, G., Gipson, T.A., Teh, T.H., Henry, G.A. and Bahr, R.J. 1994. Determination of fetal numbers in Alpine does by real-time ultrasonography. *Small. Rumin. Res.*, **14**: 225-231.

Dawson, L.J. 1999. Pregnancy Diagnosis in Goats. Proc.14 Ann. Goat Field Day, Langston University, Langston, Oklahoma U.S.A., **14**: 97-103.

Doize, F., Vaillancourt, D., Carabin, H., Belanger, D. 1997. Determination of gestational age in sheep and goats by transrectal ultrasonographic measurement of plancentome. *Theriogenology* **48**: 449–460.

Fowler, D.G. and Wilkins, J.F. 1984. Diagnosis of pregnancy and number of the fetuses in sheep by real-time ultrasonic imaging. *Livest. Prod. Sci.,* **11**: 437-450.

Gearhart, M.A., Wingfield, W.E., Knigh,t A.P., Smith, J.A., Dargatz, D.A., Boon, J.A. and Stokes, C.A. 1988. Real-time ultrasonography for determining pregnancy status and viable fetal numbers in ewes. *Theriogenology.*, **30**(2): 323-337.

Haibel, G.K. (1990) Use of ultrasonography in reproductive management of sheep and goat herds. In: M.C. Smith, Editor, Advances in Sheep and Goat Medicine. The Veterinary Clinics of North America Food Animal Practice vol. 6, no. 3, W.B. Saunders, Philadelphia. 597–613.

Harwood, D. and Matthews, J. 2006. David Harwood John Matthews Guide. Goat Medicine and Surgery. 13-114.

Hesselink, J.W. and Taverne, M.A. 1994. Ultra-sonography of the uterus of the goat. *Vet. Q.*, **16**(1): 41-5.

17th Indian live stockcensus. 2003. Ministry of agriculture (India). @dahd.nic.in/dahd/statistics.

Kahn, W., Kahn, B., Richter, A., Schulz, J. and Wolf, M. 1992. Sonography during the pregnancy of sheep.1. Fetometry for the determination of the stage of gestation and prediction of the time of parturition. *Dtsch Tierarztl Wochenschr*, **99**(11): 449-452.

Keith, C. and Ken, H. 2006. Why diagnose the number of lambs in ewes. Department of Agriculture and food farm note, Govt. of Western Australia. **74/99**.

Logue, D.N., Hall, J.T., McRoberts, S., Waterhouse, A. 1987. Real-time ultrasonic scanning in sheep: the results of the first year of its application on farms in south-west Scotland. *Vet. Rec.,* **121**(7): 146-9.

Martinez, M.F., Bosch, P. and Bosch, R.A. 1998. Determination of early pregnancy and embryonic growth in goats by transrectal ultrasonographic scanning. *Theriogenology* **49**(8): 1555-65.

Mohammed, M., Watnabe, G., Absy, G., Sasaki, K., Sharawy, S. and Taya, K. 2004. Early pregnancy diagnosis by means of ultrasonography as a method of improving reproductive efficiency in goats. *J. Reprod. Develop.*, **50**(4): 391-7.

Padlla-Rivas, G.R., Sohnrey, B. and Holtz, W. 2005. Early pregnancy detection by real-time ultrasonography in Boer goats. *Small. Rumin. Res.*, **58**: 87-92.

Parraguez, G.V.H., Gallegos, J.L.M., Raggi, L.A.S., Manterola, H.B. and Munoz, Y.B.M. 1999. Early pregnancy diagnosis and determination of embryo number by Transrectal echography in Chilean Creole goats. *Archivos de zootecnia.*, **48**: 183 271.

Restall, B.J., Milton, J.T., Klong-Yutti, P. and Kochapakdee, S. 1990. Pregnancy diagnosis in Thai native goats. *Theriogenology.,* **34**(2): 313-7.

Scott, R.R.H. and Theresa, A.A. 2001. Small ruminant clinical diagnosis and therapy, **612**: 625-0280.

Stephan, W. 2007. Reproductive Management of the Meat Goat" Agriculture Research Service United States Department of Agriculture sited at www. GoatWorld.Com.

Sugunaa, K., Mehrotraa, S., Agarwal, S.K., Hoqueb, M., Singha, S.K., Shankera, U. and Saratha, T. 2008. Early pregnancy diagnosis and embryonic and fetal development using real time B mode ultrasound in goats. *Small. Rumin. Res.*, **80**: 80-6.

Taverne, M.A., Lavoir, M.C., Van Oord, R. and Van Der Weyden, G.C. 1985. Accuracy of ultrasound scanning. *Vet Q.,* **7**(4): 256-63.

White, I.R., Russel, A.J. and Fowler, D.G. 1984. Real-time ultrasonic scanning in the diagnosis of pregnancy and the determination of fetal numbers in sheep. *Vet Rec.*, **115**(7): 140-3.

Zipper, N., Kaulfuss, K.H., May, J., Elze, K. 1997. Real-time ultrasonographic pregnancy diagnosis (B-mode) in sheep. *Determination of the number of embryos and fetuses Tierarztl Prax.* **25**(3): 212-22.