



## EVALUATION OF TWO DIFFERENT ULTRASONIC APPROACHES IN EARLY GESTATION PERIOD RECOGNITION AND FETAL SEXING IN GOATS

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### Abstract

The objective of the present study was to evaluate the efficiency of two different ultrasonic approaches in gestation period determination and fetal sexing in goats. Twelve estrous synchronized goats were subjected into two different ultrasound scanning approaches: trans-rectal ultrasonic approach and trans-abdominal ultrasonic approach at five day different activities (15-20, 21-25, 26-30, 31-35 and 36-40 days) of gestation. While fetal sexing was estimated during 35-60 day of gestation. Date of insemination was considered the day (zero) of gestation in our records as control for the pregnant goats. The results showed significant differences at ( $P < 0.05$ ) refers to the accuracy of trans-rectal ultrasound approach that were 49%, 67%, 77%, 81% and 85% in gestation period determination while for the accuracy of trans-abdominal ultrasonic approach were 5%, 42%, 46%, 68% and 76%. Both approaches were applied at the same five day different activity of gestation. Furthermore, trans-rectal ultrasound approach showed high significant differences ( $P < 0.05$ ) refers to the accuracy in fetal sexing that were 67%, 78% and 93.4% during 35-40, 45-50 and 55-60 days of gestation. In conclusion, the trans-rectal ultrasonic approach is more accurate than trans-abdominal ultrasonic approach in early gestation period recognition and fetal sexing in goats.

**Keywords:** Ultrasonography, Goat, fetal sexing, gestation.

### Introduction

Goats fertility enhancement and food supplementation for pregnant and non pregnant goats can easily managed after an early diagnosis of gestation. Different methods have been used for pregnancy diagnosis in small ruminants (Bazer *et al.*, 2007). Here, the two approaches for gestation determination; first; the Trans-abdominal (Ali and Hayder, 2007) and second; the Transrectal approach (Raja-Khalif *et al.*, 2014) both are fast-field achieved methods 1.5-2.5 min. for transrectal and transabdominal examination respectively (Padilla-Raivas *et al.*, 2014, Fernando *et al.*, 2004). By ultrasound images; identification of fluids from soft tissues and distinguish between soft tissues based on their composition makes it better than radiography for soft tissues structures examination (Nyland and Matton, 2002). Fetal gender determination has several implications in the animal breeding industry. Consequently it is of high impact in dairy and meat production in goats flocks (Santos *et al.*, 2007). This study was designed to evaluate the accuracy of trans-rectal and trans-abdominal ultrasound scanning in recognition of early gestation periods in goats and fetal sexing as well.

### Materials and Methods

Twelve multiparous goats of local Iraqi breed (aged 1.5-4years) were subjected to estrous synchronization using intra-vaginal sponges (CHRONOGEST, 40 mg cronolone, Intervet International B.V. Boxmeer, Netherlands) for a period of 12 days. Day of estrus was considered the day (zero) for controlling the gestation period and all synchronized females were let with two fertile bucks for natural breeding. B-mode real-time ultrasonic scanner equipped with a 3.5-5 MHz sector array and 5-7.5MHz linear array transducer (WellD ultrasound, Shenzhen well. D. Medical Electronics Co. Ltd. China). Light wave record and play video, USB 2.0 TV BOX. Each female was subjected to the ultrasonic scanning approach, starting from Day 15 up to Day 40. Trans-rectal ultrasound (TRUS) and Trans-abdominal ultrasound (TAUS) were applied starting from day 15 to day 40 for early pregnancy diagnosis. Then for

fetal sexing; TAUS scanning was applied during 35-60 day of gestation. The TRUS was equipped with linear probe, the probe was fastened to a plastic rod (length 30cm, 2cm in diameter) according to Hussein and Omran, 2007. For statistical analysis of our current data, least significant differences (LSD) test was applied to find out the accuracy. Accuracy was calculated as the number of pregnant female /total females scanned.

### Results and Discussion

Results of our current study as in Table (1) showed that the TRUS have had higher accuracy than TAUS in determination of gestation period in pregnant females. Particularly, it is more obvious that the accuracy of TRUS in early gestation period.

**Table 1 :** Accuracy of TRUS and TAUS in Determination of the Gestation period.

Five days activity during post estrus			LSD value
	TRUS %	TAUS%	
15-20	49 <sup>a</sup>	5 <sup>b</sup>	6.926
21-25	67 <sup>a</sup>	42 <sup>b</sup>	6.073
26-30	77 <sup>a</sup>	46 <sup>b</sup>	6.814
31-35	81 <sup>a</sup>	68 <sup>b</sup>	8.568
36-40	85 <sup>a</sup>	76 <sup>a,b</sup>	5.896
LSD value	7.382 *	9.644 *	---

Values with different superscriptions means significance ( $P < 0.05$ ). significant differences was analyzed by LSD

Our images obtained by transrectal ultrasonic scanning showed features of early embryonic recognition, which agree to the findings by the previous studies (Raja-Khalif *et al.*, 2014; Roukbi, 2013). In the current study, the accuracy of TRUS (49%) compared to TAUS (5%) in 15-20day was much higher because the false negative recognition by TAUS when the trophoblastic vesicle and/ or the embryo were difficult to be recognized (Raja-Khalif *et al.*, 2014). The other explanation is, due to the false positive recognition which made more confusion with intrauterine fluids

originated from non-pregnancy related physiology (Mohammed *et al.*, 2004), or confused with embryonic vesicle, intestine loops, blood vessels or pathological conditions (Gonzalez-Bulnes *et al.*, 2010).

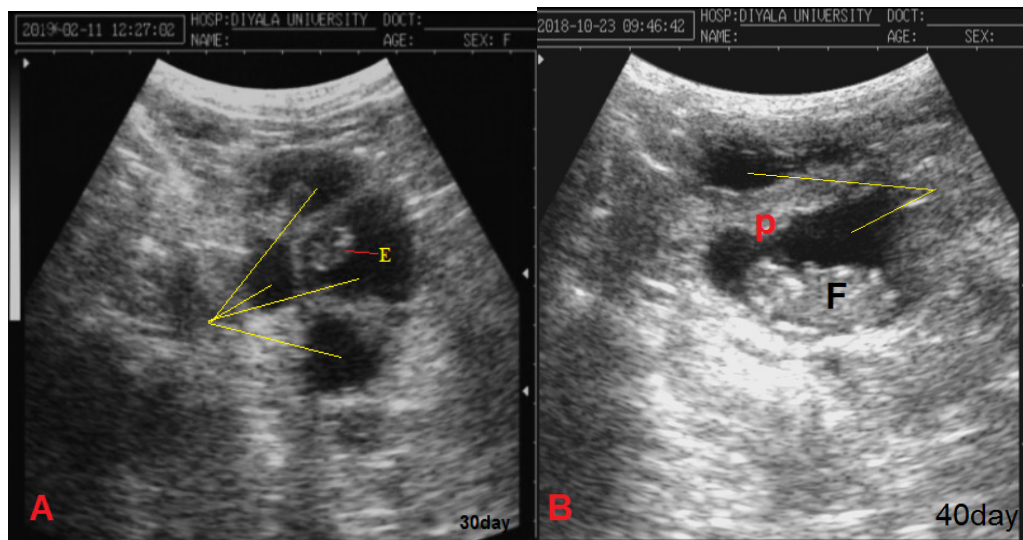
The results of our study were revealed that the TRUS approach is the best of choice for early detection of pregnancy since the gravid uterine horn is very well situated in the pelvic region plus very clear visualization of the embryonic vesicle as fluids-filled dilatation starting from the day 15<sup>th</sup> of gestation (Gonzalez-Bulnes *et al.*, 1998). Moreover, the lowest accuracy of TAUS was observed during first, second and third five day activity of gestation compared to TRUS approach. This might be contributed to the structures (tissues) in the abdomen which make more difficult to interpret the ultrasonographic images (Manol *et al.*, 2018).

Moreover, the age of the animal was another factor that influenced the accuracy of ultrasound scanning (Fridlund *et*

*al.*, 2016). Thus, the accuracy was much lower when scanning was performed in a very early stage (15-19 days) of gestation for both approaches.

Our current results were in agreeing with the findings of Raja-Khalif *et al.* in 2014 when he reported that the accuracy of TRUS approach during the end of the first trimester of pregnancy was 96%. On the other hand, Aziz and Lazim (2012) reported that accuracy of TAUS was 80% during days 28-32 post inseminating in Awassi ewes. These results disagree with the findings of our current study. The disagreement can be explained by different reasons such as species of animal, improper animal restraining resulting in improper of structure scanning.

According to the result of Fridlund *et al.* (2016) accuracy of pregnancy scanning using transabdominal ultrasonography during 30-40day of gestation was (71%), these result coincided with our current results during the similar period of gestation (figure-2).



**Fig. 2:** Trans-abdominal ultrasonic images of early pregnancy. **A** =30 day and **B**= 40day; **F**=fetus ; **E**= Embryo; **P**=placentome ; fetal fluids delineated by yellow lines (Sector probe, 3.5MHz).

The result of the current study was covenant with previous reports of Schrick and Inskeep (1993) and Gonzalez-Bulnes *et al.* (1998) who visualize of embryo from day 16 in goats using high frequency implemented trans-rectal ultrasound approach. Amer (2008) and Anya *et al.* (2017) reported that accuracy of pregnancy diagnosis reached 100% during 40day via trans-rectal ultrasound examination. The most common cause for a discrepancy with our result might be attributed to high frequency probe (8MHz) used in previous study, the overnight fasting before scanning as well as the site of ultrasonic scanning had to be clipped prior scanning. All of the mentioned factors were of impact to facilitates the transmission of ultrasound waves and overall images improvement.

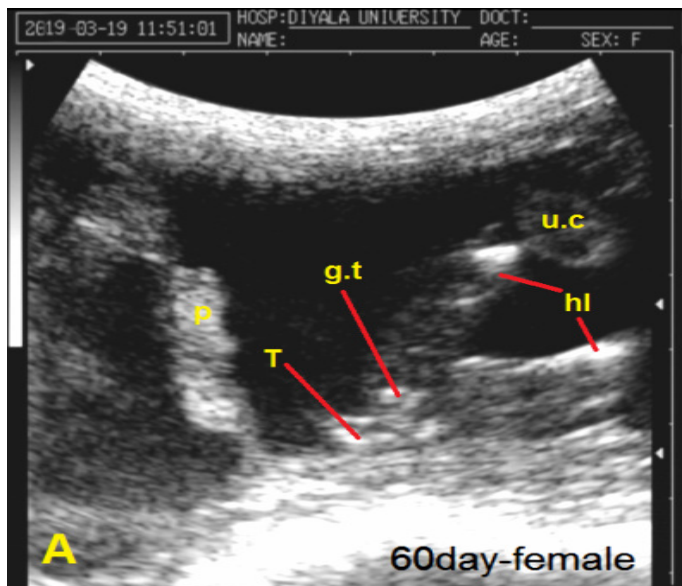
Garcia *et al.* (1993) founded that detected early pregnancy were accurately diagnosed by trans-rectal were (50%) during 15-24 day of gestation, but reached 85% on days 32-34 in ewes. In the same context, Gonzalez *et al.* (2004), observed the accuracy of pregnancy diagnosis using the TRUS technique during (20-22) and (24-26) days were 64% and 89.3%, respectively. These results were similar observes in the current study.

In the current study, Fetal sexing accuracy was showed a significant difference ( $P < 0.05$ ) within the gestation of 35 to 60 days. Fetal genital tubercle was observed from day 35 of pregnancy using trans-rectal and trans-abdominal ultrasound scanning and we founded that accuracy of fetal sex was 67%, 78% and 93.3% during days 35-40, 45-50 and 55-60, respectively. A similar accuracy was reported by Santos *et al.* (2007) and Barbosa dos Santos *et al.* (2007), they revealed that accuracies of fetal sexing were 92.8% and 92.6%, respectively. The current study was demonstrated that fetal sexing can be accomplished from day 55 onward with high accuracy using trans-abdominal ultrasound approach.

Furthermore, estimation accuracy of fetal sex under field conditions is high when ultrasonic imaging was performed with proper equipment by experienced operators (deFreiras *et al.*, 2010; Roukbi, 2013). According to earlier studies and our study, the assumption that the exact identifier of fetal sex before day 50 of gestation was lower, these results may be attributed to the delay of genital tubercle migration up to the fifth day of gestation due to each difference as well as breeds variation of animals (Coubrough and Castell, 1998; deFreiras *et al.*, 2010). Moreover, the increase misdiagnosis of genital tubercle might be due to

type of pregnancy (single or multiple), considering this latter episode, the accuracy error rate for fetal sex increases (Lilian *et al.*, 2009).

In conclusion, Transrectal US has been shown to be an exact approach for early pregnancy diagnosis in goats and we conclude that during the early stage (15-40) day of gestation TAUS approach is not practical due to difficulties in obtaining proper images. Fetal gender estimating is a procedure that may be incorporated into the routine of field goat's reproductive examinations with a high accuracy rate of the 55<sup>th</sup> day of gestation. Moreover, this study proves that detection of early pregnancy in goats via US depend on the approach, the frequency of transducers used, age of pregnancy as well as the ability of the operator.



**Fig. 3 :** Trans-abdominal ultrasonic images of female fetus (A=60 day) and male fetus (B= 50day). **g.t**=genital tubercle; **S**=scrotum; **hl**=Hindlimbs; **fl**=Forelimbs; **T**=tail; **p**=placenta; **u.c**=umbilical cord (cross section). (Sector probe, 3.5MHz).

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