

Ultrasonic Scanning for Placentome Size in Pregnant Maraz Goat in Sulaimani Province

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Abstract

The aim of the study was determination of the relationship between pregnancy age and placentome measurement by using an ultrasound technique. This study was conducted in some private farms in Sulaimani province. A total of seventy-two Maraz does were checked by using transabdominal and transrectal ultrasonic transducers for pregnancy status, 47.2% (34/72) of these goats were pregnant. Twenty-seven non-pregnant does were synchronized for estrus by using vaginal sponges for 11 days followed by injection of 500 IU of PMSG hormones after withdrawing the sponges and naturally served to obtain pregnancy. 63% (17/27) of the synchronized goats became pregnant, all synchronized goats were scanned every seven to ten days beginning from day 35 to 140 of gestation transabdominally (TA) with sector-probe (4-5MHz) and transrectally (TR) with linear-probe (7.5-9 MHz). The placentomes width and height increased significantly ($P \leq 0.05$) with the progress of the gestation period, and the first observation of placentomes were in 32 and 42 days by depended (TR) and (TA) respectively. The width and height were 10.2 mm and 9.8 mm respectively during 40-50 days of gestation and maximum sizes were 45 mm and 38 mm in 130 days of gestation period. There is a little significant difference ($P \leq 0.05$) between single and twin pregnancy just in 61-70 and 81-90 days of gestation period. In conclusion, there is a strong relationship between the size of placentome and the progress of pregnancy, there are no serious differences in the size of placentomes in single and multiple pregnancy goats, and using transrectal scanning is useful for early detection of pregnancy.

Keywords: Ultrasound technique, Pregnancy diagnosis, Maraz goats

قياس فلقات المشيمة للماعز من نوع مارز باستخدام مسح السونار في محافظة السليمانية

الخلاصة

الهدف من هذه الدراسة هو تحديد العلاقة بين فترة الحمل وقياس فلقة المشيمة باستخدام تقنية الموجات فوق الصوتية. واجريت الدراسة في المزارع الخاصة في محافظة السليمانية فحصت 72 معزة من سلالة المرعز للتحري عن الحمل باستخدام تقنية الموجات فوق الصوتية وذلك من خلال الفحص عبر جدار البطن وعبر المستقيم. اظهرت النتائج ان نسبة الحمل بلغت 47.2% (34/72). تمت تطبيق برنامج توحيد الشبق على عدد من الماعز البالغ 27 من غير الحامل باستخدام البروجسترون المهبلي لمدة 14 يوما تليها حقن 500 وحدة دولية من هرمون PMSG بعد سحب الاسفنجات المهبلية. بلغت نسبة الحمل 63% (17/27). تم متابعة الفحص كل عشرة ايام بواسطة السونار ابتداءً من اليوم 35 ولغاية اليوم 140 وذلك بواسطة الفحص عبر جدار البطن باستخدام مجس ذو تردد 4-5MHz وعبر جدار المستقيم بمجس ذو تردد 7.5-9MHz تبين في الدراسة وجود علاقة قوية بين حجم الفلقات وعمر الجنين خلال فترة الحمل وايضا تم ايجاد فروقات معنوية ($P \leq 0.05$) لقياسات فلقات المشيمية لفترة الحمل وهناك فرق معنوي بسيط ($P \leq 0.05$) بين حمل جنين واحد والتوائم لفترة الحمل (61-70) و (81-90) وبعتبر استخدام جهاز السونار عن طريق المتستقيم اداة جيدة لكشف عن الحمل المبكر في حيوانات المزرعة

Introduction

The natural copulation dates of small ruminants often are unrecorded and unprecise and this will affect indirectly on breeding management. Moreover, precise knowledge about pregnancy stages of goats will be useful to avoid any disorders near birth (1). Early investigation of embryo in goats are essential for economic point, also to categorize the flock to pregnant and non-pregnant animals (2). There are many laboratory and clinical methods to detect pregnancy in animals but using ultrasound technique considers the reliable technique for early detection of embryo and to put a valuable strategy for animal farms (3). B-mode ultrasonic technique considers precise, fast and safe way for pregnancy detection in small ruminants. Transabdominal or transrectal approaches may be useful about 100% accuracy rate (4-7). Depended real-time ultrasonic technique is so benefit to following growth and developments many parts of fetus such as CRL (Crown-Rump Length), head, trunk and, heart beat) without any harmful effect on pregnancy status (8-12).

Trans-abdominal ultrasonic technique has depended with great precise as a good way for pregnancy detection and determination of fetal growth in does (13), in goats as by Gonzalez et al. (14) and Kumar et al. (15) who recorded the relation of bi-parietal diameter, trunk diameter, crown-rump length and uterine diameter with pregnancy period in the cows and (16) reported the change of the Bi-parietal diameter during pregnancy in goats, There are few studies about using ultrasonic technique to detect early embryo in Maraz goat in Sulmani province by investigation placentomes size to determine age of fetus and for this reason our study aim to detect the relationship between gestation age and the size of placentomes in Maraz goats.

Materials and methods

Animals and management

A total of 72 Maraz goats were obtained from many different private farms located in Sulmani province, Iraq between Decembers. 2021 to October 2022. The animals were aged 2–3 years, weighed 30–45 kg, and managed under free grazing. The goats were also fed according to field management after providing concentrated feed, which consisted of alfalfa, corn silage, beet pulp, cottonseed, soybean, corn, and barley. The goats were in one field under the same condition management, environment and feeding system. These animals were kept in an outdoor near the rivers for wallowing and milked twice daily. Individual animal data on parturition history, lactation, breed, parity were recorded.

Ultrasonic scanning

Seventy two Maraz goats were scanned for routine pregnancy checking by depended transabdominal and transrectal ultrasonic examination using real-time B-mode scanner. Two types of ultrasound machine used in this study transabdominal examination was achieved by Sonascope (China) with 3.5-5 MHz convex array transducer, and also using linear array transducer, transrectal portable ultrasound (draminski from Europe) with frequency range between 3.5-9 MHz. The goats were scanned in standing position and without shaving and fasting (17). The ultrasonic special gel applied in right side of animal area in cranial of udder (18). The transducer in transrectal way was held into a plastic rod about (30cm) length and about (20mm) in diameter and scanning done according to method described by Gonzalez et al. (19).

Twenty-seven of non-pregnant of Maraz goats were synchronized for estrus by inserted vaginal sponges by special applicator for 14 days contain Medroxyprogesterone

acetate/sponge 60 mg (Esponjivet, LABORATORIOS HIPRA, S.A., Spain), After two weeks, these vaginal sponges were withdrawn and 500 IU PMSG (serum gonadotrophin, OVISER 5000 IU, LABORATORIOS HIPRA, S.A. Avda. la Selva, Girona, Spain) injected intramuscular, and estrus detected during 72 hours. Fertile males were used for natural breeding for these goats and day of estrus and copulation considered day one of gestation period (20)

All synchronized Maraz goats were scanned every ten days interval beginning from day 35 of gestation until 140 days to calculate width and height placentome during this period. The width of placentome was got by measurement the distance between both lateral edges while the height was got by determine the distance between free edge of placentome near the uterine lumen and base of placentome adjacent to uterine wall (21). The size of placentome in single and twin fetus were calculated during gestation period

The statistical analyses were conducted by using SPSS software (version 18.0, IBM SPSS Inc., Chicago: USA). The correlation between width and height of placentome with gestational age was calculated.

All values are expressed as the mean \pm standard error of the mean. The significant differences for the placentome size in different times of gestation period were calculated using one-way ANOVA as well as Tukey and Duncan post hoc tests at the probability threshold $P < 0.05$.

Results and Discussion

The results of the current study showed low pregnancy rate 47.2 % out the season for Maraz goats (Table 1), may be the effect of season was clear. The goat considers seasonal breeding animals that shows signs of estrus when light day be short and conception rate reach about 85-90 % (21).

More than 250 ultrasonic scanning were obtained for twenty-seven synchronized Maraz goats during 35-140 days of gestation period. A total of 27 synchronized goats and natural breeding after showed estrus cycles, just 62,9 % (17/27) were pregnant after confirmation the conception by using ultrasound scanning during progress checking for these animals (Table 1) Fig, 1 - 8. This study recorded significant impact ($P \leq 0.05$) for placentomes growth with advance gestation age (Table 2), and this agree with many previous studies that registered high relationship between size of placenta and pregnancy progress (22, 23).

Table 1: Average of pregnant goat in first ultrasonic scanning and second for synchronized goats

Ultrasonic check	No. of goats	Pregnant	Non-pregnant	
First scanning	72	47.2 % (34/72)	52.8% (38/72)	
			Synchronized goat (N=27)	
			Pregnant	Non-pregnant
Second scanning			62.9% (17/27)	37.1% (10/27)

This study depended calculated the width and height of placentome because it considers most common parameter easy to follow progress during gestation period (21,22). The current study demonstrated placentome at day 32 day of pregnancy by detect small echogenic mass (4.5 mm) adjacent to endometrium by using transrectal probe. The placentome was firstly obtained by day 42 of pregnancy by using transabdominal scanning.

Table 2: The mean measurement (mm) of placentome width and height (Mean \pm SEM) in Maraz goat

Pregnancy period (days)	Placentome width (mm)	Placentome height (mm)
35-39	6.6 \pm 1.1	4.8 \pm 1.9
40-50	10.2 \pm 1.9	8.9 \pm 1.7
51-60	16.8 \pm 1.1	14.6 \pm 0.6
61-70	20.6 \pm 2.3 ^a	16.5 \pm 2.8 ^b
71-80	26.2 \pm 1.6	21.3 \pm 2.1
81-90	28.4 \pm 2.6 ^a	25.6 \pm 1.9 ^b
91-100	30.3 \pm 2.5	27.1 \pm 1.5
101-110	31.3 \pm 2.4	30.7 \pm 1.8
111-120	36.4 \pm 2.5	32.6 \pm 3.1
121-130	39.2 \pm 1.6	34.8 \pm 2.3
131-140	42.5 \pm 2.6	35.9 \pm 3.7
	P < 0.05	

ab different superscript letters within rows indicate a significant difference at P < 0.05.

Many previous studies also agree with our finding by detecting placentomes in west African dwarf goats and in black goats in Iraq (22, 24). Also, another previous study by Karadaev et al (25) showed first observation of placentomes in day 42 of gestation in local goats in Bulgaria. Anyway, many other previous studies recorded first detecting of placentomes early than our finding by depended transrectal scanning in local animals in Egypt (23, 26). A previous study for (13) demonstrated placentome early in first observation in day 25 of gestation period in ewe, anyway, because the placentome locate close and adjacent to the uterine wall may lead to failure to detect it in less than one month of

pregnancy while it be echogenic mass and very clear in advance pregnancy (22).

The size of placentome increased with advance of gestation period as C shape or circle echogenic appearance surround with an echogenic black fetus fluid by ultrasonic scanning (22, 27) (fig.2-8), peak of size of placentome in this study was 39-45 mm between 120-140 day of pregnancy (fig,8). This finding disagrees with many previous studies that recorded maximum size of placentomes between 74-90 day of gestation period in ewes (27, 28, 29).



Figure, 1: Trans-rectal Ultrasonic images of 52 days of pregnancy, p= Placentome: a.f: Allantois fluid, f: fetus

A previous study (27) concluded that lack of the ability to observe and calculate the placentomes after three months of gestation period especially by using transrectal ultrasonic scanning 5 MHz transducer. But in same time many other studies agreed with our findings and registered maximum size of placentomes was in 125 day of pregnancy (22, 30). The placentomes width size were 10.2-16.8 mm between 40-60 day of gestation period and reached maximum size 44.5 mm during the period 131-140 days in pregnancy period, these findings agreed with many previous studies in shami and black local goat in Iraq by recording 17.4- 18.5 mm between 55-65 day of pregnancy

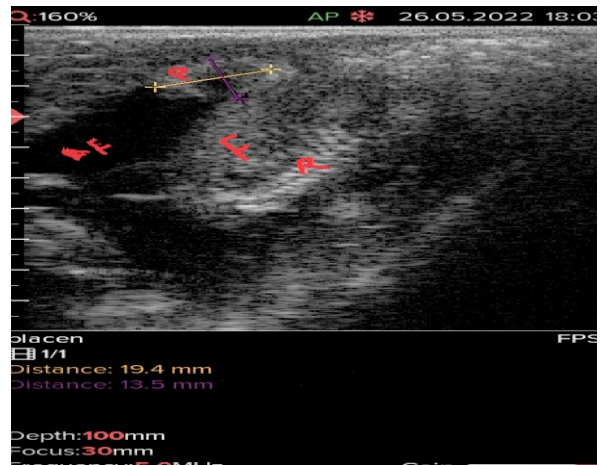
respectively (22, 26). While our findings disagreed with few previous studies that recorded between 12.4-14.2 mm between 55-65 day of gestation period in many different goat breeds (31, 32). Contrast between different findings of these studies with our findings may be related to different goat breeds that depended, types of ultrasound probes that used and the skill of examiner (33).



Figure, 2: Trans-rectal Ultrasonic images of 52 days of pregnancy, p= Placentome:



Figure, 3: Trans-abdominal Ultrasonic images of placental diameters (P) at gestational age 52 day



Figure, 4: Trans-rectal ultrasonic images of PD in single pregnancy (58 days). P: placentomes, a.f: Allantois fluid, f: fetus and R: ribs.

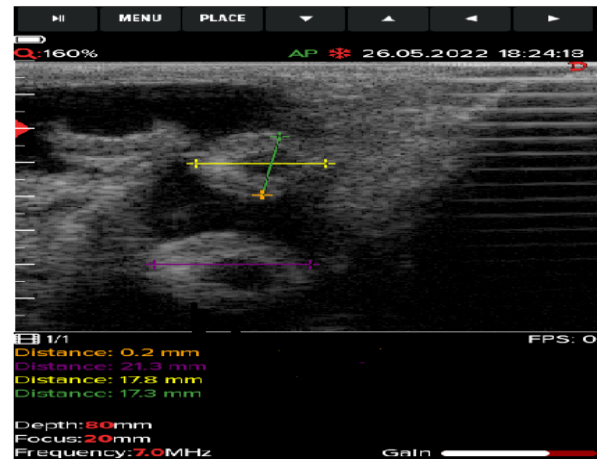
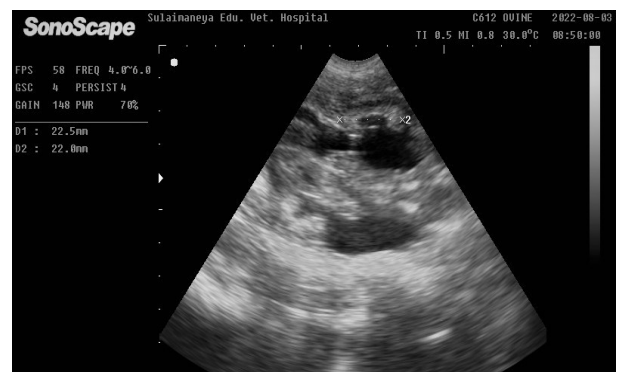


Figure 5: Trans-rectal ultrasonic images of PD in single pregnancy (58 days). P: placentomes



Figure, 6: Trans-abdominal Ultrasonic images of placental diameters (P) at gestational age 65 day

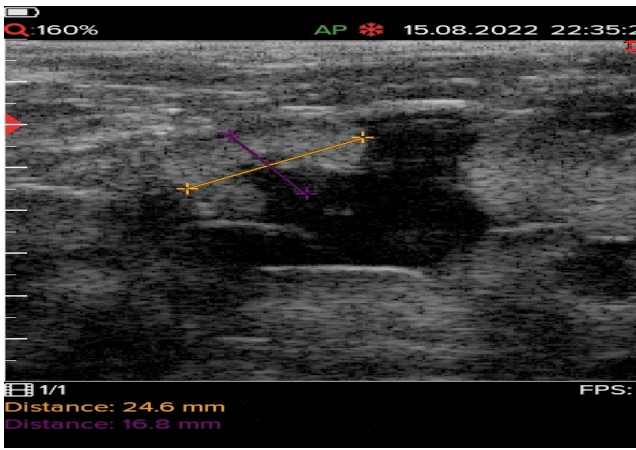


Figure 7: Trans-rectal ultrasonic images of PD in single pregnancy (75 days)

The current study did not get big difference of size of placentomes in single and twin pregnancy during progress gestation period (Table 3), there was a significant difference ($P \leq 0.05$) just in both 61- 70 day and 81-90 day of gestation period for single pregnancy (Table 3). This finding disagreed with many previous studies that got a significant difference between single and multiple gestation, and placentomes size were larger in goat that has many fetuses than single one (22). Also, another study demonstrated that placentomes size depend on the number of fetuses during stages of pregnancy until week 11 of gestation period (34). Anyway, our finding agreed with previous study that did not find any difference in size of placentomes in single and twin’s ewes (35).

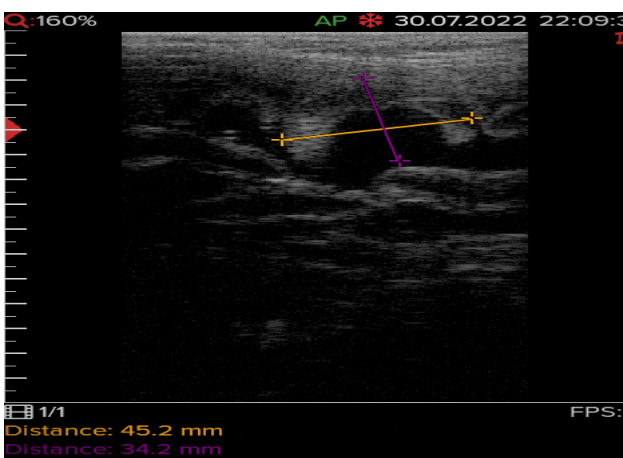


Figure 8: Trans-rectal ultrasonic images of PD in single pregnancy (140 days).

Table 3: The mean diameter of placentome (Mean ± SEM) in single and twin pregnancy Maraz goats

Pregnancy period (days)	Placentome width (mm)	
	Single pregnancy	Twins or triple pregnancy
40-50	10.2 ± 0.9	9.8 ± 0.7
51-60	17.3 ± 1.1	16.6 ± 0.6
61-70	21.6 ± 2.3 ^a	18.5 ± 1.1 ^b
71-80	25.8 ± 1.6	24.3 ± 2.1
81-90	30.4 ± 2.6 ^a	27.6 ± 1.6 ^b
91-100	31.3 ± 2.5	32.1 ± 1.5
101-110	32.3 ± 2.4	32.7 ± 1.8
111-120	36.4 ± 2.5	35.6 ± 3.1
121-130	39.2 ± 1.6	38.8 ± 2.3
131-140	42.5 ± 2.6	41.9 ± 3.7

^{a,b} different superscripts letters within rows indicate a significant difference at $P < 0.05$

Table 4: Correlation of gestational age with width and height of placentome

	GESTATIONAL AGE	WIDTH	HEIGHT
GESTATIONAL AGE	1.000	0.968	0.982
WIDTH	0.968	1.000	0.988
HEIGHT	0.982	0.988	1.000

The current study reported a high significant correlation between gestation age and size of placentome during gestation period in animal of the study (table 4).

Conclusion

There is a strong relationship between size of placentome and progress of pregnancy, there are no serious significant difference in size of placentomes in single and multiple pregnancy goats and using transrectal scanning is useful to early detect of pregnancy.

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Conflict of interest:

The authors declare that there is no conflict of interest

References

- 1- Doize F, Vaillancourt D, Carabin H, Belanger D. Determination of gestational age in sheep and goats using transrectal ultrasonographic measurement of placentomes. *Theriogenology*. 1997 Aug 1;48(3):449-60.
- 2- Jotov S, Dimitrov M, Vasilev N. Early pregnancy diagnosis and examination of embryofoetal growth in the local ovine breed. *Bulgarian Journal of Agricultural Science*. 2005.
- 3- Martinez MF, Bosch P, Bosch RA. Determination of early pregnancy and embryonic growth in goats by transrectal ultrasound scanning. *Theriogenology*. 1998 Jun 1;49(8):1555-65.
- 4- Haibel GK. Use of ultrasonography in reproductive management of sheep and goat herds. *The Veterinary clinics of North America. Food animal practice*. 1990 Nov 1;6(3):597-613.
- 5- Peixoto GC, Silva AR. Diagnóstico De Gestação E Sexagem Fetal Em Caprinos Por Ultrassonografia. *Acta Veterinaria Brasílica*. 2010 Jul 27:S30-5.
- 6- Karen A, El Amiri B, Beckers JF, Sulon J, Taverne MA, Szenci O. Comparison of accuracy of transabdominal ultrasonography, progesterone and pregnancy-associated glycoproteins tests for discrimination between single and multiple pregnancy in sheep. *Theriogenology*. 2006 Jul 15;66(2):314-22.
- 7- Abdelghafar RM, Bakhiet AO, Ahmed BH. B-mode real-time ultrasonography for pregnancy diagnosis and fetal number in Saanen goats. *Journal of Animal and Veterinary Advances*. 2007.
- 8- Rasheed YM. Assessment of gestational age in goats by Real-Time Ultrasound measuring the fetal crown rump length, and bi-parietal diameter. *The Iraqi Journal of Veterinary Medicine*. 2017;41(2):106-12.
- 9- Sinclair KD, Dunne LD, Maxfield EK, Maltin CA, Young LE, Wilmut I, Robinson JJ, Broadbent PJ. Fetal growth and development following temporary exposure of day 3 ovine embryos to an advanced uterine environment. *Reproduction, Fertility and Development*. 1998;10(3):263-70.
- 10- Kaulfuss KH, Uhlich K, Gille U. Ultrasonographische Messung zum fetalen Wachstum des Schafes zwischen dem 20 and 50. Trächtigkeitstag. *Dtsch. Tierärztl. Wschr*. 1999;106:433-8.
- 11- Noia G, Romano D, Terzano GM, De Santis M, Di Domenico M, Cavaliere A, Ligato MS, Petrone A, Fortunato G, Filippetti F, Caruso A. Ovine fetal growth curves in twin pregnancy: ultrasonographic assessment. *Clinical*

- and experimental obstetrics & gynecology. 2002 Dec 10;29(4):251-6.
- 12- Al-Rawi HM. Clinical uses of ultrasonic technique in reproductive management in ewes. Philosophy of Doctorate Thesis, College of Veterinary Medicine, University of Baghdad. 2005.
 - 13- Buckrell BC. Applications of ultrasonography in reproduction in sheep and goats. *Theriogenology*. 1988 Jan 1;29(1):71-84.
 - 14- González F, Cabrera F, Batista M, Rodríguez N, Álamo D, Sulon J, Beckers JF, Gracia A. A comparison of diagnosis of pregnancy in the goat via transrectal ultrasound scanning, progesterone, and pregnancy-associated glycoprotein assays. *Theriogenology*. 2004 Sep 15;62(6):1108-15.
 - 15- Kumar K, Chandolia RK, Kumar S, Pal M, Sandeep K. Two-dimensional and three-dimensional ultrasonography for pregnancy diagnosis and antenatal fetal development in Beetal goats. *Veterinary World*. 2015 Jul;8(7):835.
 - 16- Metodiev N, Dimov D, Ralchev I, Raicheva E. Measurements of foetal growth via transabdominal ultrasonography during first half of pregnancy at ewes from synthetic population Bulgarian milk. *Bulgarian Journal of Agricultural Science (Bulgaria)*. 2012.
 - 17- Waziri MA, Ikpe AB, Bukar MM, Ribadu AY. Determination of gestational age through trans-abdominal scan of placentome diameter in Nigerian breed of sheep and goats. *Sokoto Journal of Veterinary Sciences*. 2017 Jun 19;15(2):49-53.
 - 18- Kähn H, Kolkmann D. *Veterinary Reproductive Ultrasonography, Schlutersche*.
 - 19- Waziri MA, Ikpe AB, Bukar MM, Ribadu AY. Determination of gestational age through trans-abdominal scan of placentome diameter in Nigerian breed of sheep and goats. *Sokoto Journal of Veterinary Sciences*. 2017 Jun 19;15(2):49-53.
 - 20- Abdullah R, Wan-Khadijah WE, Rahman AN. Estrus synchronization and superovulation in goats: a review. *Journal of Biological Sciences*. 2008;8(7):1129-37.
 - 21- Muhammad RS, Aziz DM. Estimation of gestational age in Shami goats based on transabdominal ultrasonographic measurements of fetal parameters. *Iraqi Journal of Veterinary Sciences*. 2022 Oct 1;36(4):839-46.
 - 22- Rasheed YM. Ultrasonic estimation of gestation age in goats via placentomes diameter. *The Iraqi Journal of Veterinary Medicine*. 2016;40(2):100-6.
 - 23- Karen AM, Fattouh ES, Abu-Zeid SS. Estimation of gestational age in Egyptian native goats by ultrasonographic fetometry. *Animal reproduction science*. 2009 Aug 1;114(1-3):167-74.
 - 24- Karen AM, Fattouh ES, Abu-Zeid SS. Estimation of gestational age in Egyptian native goats by ultrasonographic fetometry. *Animal reproduction science*. 2009 Aug 1;114(1-3):167-74.
 - 25- Karadaev M, Fasulkov I, Vassilev N, Petrova Y, Tumbey A, Petelov Y. Ultrasound monitoring of the first trimester of pregnancy in local goats through visualisation and measurements of some biometric parameters. *Bulgarian Journal of Veterinary Medicine*. 2016;19(3):209-17.
 - 26- Hussein KA. Detection of single and multiple pregnancy depending on placentomes measurement in Shami goats in Iraq by Ultrasonography. *The*

- Iraqi Journal of Veterinary Medicine. 2017;41(2):118-23.
- 27-Doize F, Vaillancourt D, Carabin H, Belanger D. Determination of gestational age in sheep and goats using transrectal ultrasonographic measurement of placentomes. *Theriogenology*. 1997 Aug 1;48(3):449-60.
- 28-Ali A, Hayder M. Ultrasonographic assessment of embryonic, fetal and placental development in Ossimi sheep. *Small Ruminant Research*. 2007 Nov 1;73(1-3):277-82.
- 29-Metodiev N, Dimov D, Ralchev I, Raicheva E. Measurements of foetal growth via transabdominal ultrasonography during first half of pregnancy at ewes from synthetic population Bulgarian milk. *Bulgarian Journal of Agricultural Science (Bulgaria)*. 2012.
- 30-Roukbi M. The use of ultrasonography for early detection of pregnancy and measurement of some foetal pattern in Damascus goats. *Iraqi Journal of Veterinary Sciences*. 2013 Jun 28;27(1):35-44.
- 31-Sayuti A, Khairiah K, Siregar T, Melia J, Syafruddin S, Rahmi E, Herrialfian H, Abrar M, Panjaitan B, Daud R. Determination of Gestational Age and Observation of Kacang Goat Fetal Development during 60 Days of Pregnancy by Using Transcutaneous Ultrasonography. *J Veteriner*. 2019 Dec 31;20(4):534-40.
- 32-Lee Y, Lee O, Cho J, Shin H, Choi Y, Shim Y, Choi W, Shin H, Lee D, Lee G, Shin S. Ultrasonic measurement of fetal parameters for estimation of gestational age in Korean black goats. *Journal of veterinary medical science*. 2005;67(5):497-502.
- 33-Gayrard V, Carrière PD, DesCôteaux L. Principles and recommendations, essential concepts, and common artifacts in ultrasound imaging. *Practical atlas of ruminant and camelid reproductive ultrasonography*. 2009 Nov 18:3-19.
- 34-Lee Y, Lee O, Cho J, Shin H, Choi Y, Shim Y, Choi W, Shin H, Lee D, Lee G, Shin S. Ultrasonic measurement of fetal parameters for estimation of gestational age in Korean black goats. *Journal of veterinary medical science*. 2005;67(5):497-502.
- 35-Kaşikçi G, Yılmaz Ö, Gündüz Mc, Kırşan İ. Comparison of placentome diameters in single and twin-pregnant sheep by ultrasonographic method. *Turkish Journal of Veterinary & Animal Sciences*. 2011;35(3):187-91.