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Effects of parity and body condition score (BCS) on oestrus expressions and post breeding reproductive performance of Katjang crossbred goat

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Abstract

This experiment goal was to identify the effect of parity and body condition score (BCS) on oestrus expressions (OE), post breeding reproductive performance (PBRP) of Katjang crossbred and changes of progesterone (P4) concentration. Twenty-four does were treated with 14 days synchronisation followed by visual observation of oestrus expressions (standing heat (SH), mounted by other buck but not standing (MBNS), vocalization (VC), tail swaging (TW), and sniffing of the genital of other buck (SGB)) and blood sampling twice daily up to 72 hours following Control Internal Drug Release (CIDR) removal. PBRP data was recorded for evaluation which included pregnancy rate (PR), abortion rate (AR), mortality rate (MR), litter size (LS), litter birth weight (LBW) and gestation length (GL). Result revealed that there was no significant effect ($P>0.05$) of parity and BCS on OE, PBRP and progesterone concentration except for birth weight which had been affected by parity. Based on observation of OE of SH, it was found that accuracy of pregnancy prediction was up to 50%. Analysis of OE established reliability of OE in was sequence from SH>SGB>TW>MBNS>VC and onset of oestrus began approximately 33h post to CIDR removal. Analysis of PBRP shown parity≤2 had heavier birth weight in single litter size than parity≥3 which was associated with no MR. Progesterone concentration indicated all of the does were on oestrus and highly susceptible as early as 48 h post to CIDR removal. In conclusion, this study demonstrated that both non-genetic factors; parity and BCS are very poor in determining the effect of OE, PBRP and P4 concentration due to limitation of sample size and greater influences of external factors such as weather, extreme environmental condition and farm management. It is recommended to improve program in future by focusing on enhancing the fertilization rate and reducing embryonic loss for optimum conception rate.

1. INTRODUCTION

Evaluations of reproductive performance in animals are carried out by breeders prior to breeding in order to achieve satisfactory results. In the case of goats, does are evaluated based on their oestrus cycle while breeding soundness evaluation (BSE) are assessed in bucks (McKenzie-Jakes and Anderson, 2015). Having said that, determination of oestrus phase in does take precedence because once oestrus phase over, breeders need to wait for the next cycle hence delaying production time. Oestrus cycle is initiated in animals once they reach puberty. During the oestrus period, animals exhibit sexual behaviour due to hormones secretion regulated by endocrine system (Schillo, 2009; Fatet et al., 2011). Other factors including parity, body condition score (BCS), body weight, year of kidding, age, climate and environment that might influence manifestation of oestrus (Chowdhury et al., 2002; Dadi et al., 2008; Jalilian and Moeini, 2013; Akar et al., 2014). Therefore, there might be a relationship between successfulness breeding and oestrus manifestation. In order to address this issue, it is essential to study on post breeding reproductive performances (PBRP) as it is a tool to measure the success of the current as well as future breeding programmes.

PBRP evaluation can assist breeders for future breeding program. Post breeding evaluation includes conception or pregnancy rate, kidding rate, mean birth weight of kid, gestation days, abortion rate, mortality rate, litter size, age at first service, age at first kidding, weight at first kidding and kidding interval (Dadi et al., 2008; Hamed, 2010; Jalilian and Moeini, 2013; Omontese et al., 2013; Ahmad et al., 2014; Syahirah et al., 2016). Generally, pre and post breeding reproductive performance is an implementation to measure the level of fertility in does and ensure the efficiency of a farm reproductive management. Thus, this research was conducted to determine the effects of parity and BCS on pre-and-post breeding reproductive performance in Katjang crossed does since they are Malaysia's native meat-type goat. Since oestrus expressions are influenced by hormone regulation in the endocrine system, hormone profile was also evaluated to determine the stages of oestrus cycle.

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2. MATERIALS AND METHODS

2.1. Animals and treatments

The experiment was conducted at a local goat farm at Jeli, Kelantan (latitude 5° 41' N and longitude 101° 50' E) with the environment temperature of 24-35℃ and 90% humidity. In order to observe oestrus expressions in one cycle, 24 non-pregnant does comprising of Katjang crossbred had been subjected to the 14-days CIDR treatment. During the experiment, each of the doe was provided feed and supplement according to the farm practice where 2 kg of Napier grass was given in the morning and 1 kg of pelleted concentrate in the evening. The does had unlimited access to water and mineral block.

The pregnancy statuses of the does were determined through abdominal palpation aligned with farm records. Does were classified into parity groups where 11 does from parity ≤2 (mean body weight = 27.72±2.66 kg and mean BCS = 3.59±0.24), and 13 does were from parity ≥3 (mean body weight = 27.06±2.24 kg and BCS =3.42±0.21). The same group of does had been classified into BCS groups were encompassed of BCS ≤ 3.5 (weighing 24.08±1.66 kg and 2.81±0.29 parity level) and BCS ≥4.0 (weighing 33.93±2.61 kg and 2.63±0.38 parity level) with total of 16 and 8 does per group, respectively. In addition, three fertile bucks between 3-4 years old were introduced to the flock for natural mating during observation of oestrus expressions.

Twenty-four non-pregnant does were conditioned into 14-days CIDR protocol as stated by Salleh et al. (2014). Every doe was inserted with 0.3 g progesterone t-shaped device intravaginally (EAZI-BREED and CIDR, Pfizer, New Zealand Ltd) for 14 days. On the withdrawal day, the does were injected intramuscularly with 200 IU PMSG (FOLLIGON®, Intervet, Australia) and 50 IU cloropstenol (prostaglandin: Estrumate®, Australia).

2.2. Visual observation and evaluation of oestrus expressions

Does were confined in one pen during the visual observation period to enable thorough observation of the event. Only one individual was responsible for visual observation of oestrus expressions for every session to avoid bias. Visual observation of oestrus expression lasted for 72 hours after CIDR removal which had been conducted at several time intervals: 24 h, 33 h, 48 h, 57 h and 72 h. Three bucks were introduced to the herd 24 h after CIDR removal for mating purpose. In order to obtain reliable results, does and bucks were confined in one area for observation of oestrus expressions. Two hours solid visual observation had been allocated for every sessions of oestrus expressions observation. After observation the bucks were place into individual pen. Figure 1 shows an illustration of oestrus expressions that might be exhibited during visual observation along with scoring points (Gray and Varner, 1984; Van Vliet and Van Eerdenburg 1996; Perry, 2004 and Schillo, 2009). Least score points indicated less important oestrus expressions where highest score points indicate the most important scoring points. The less important oestrus response is the expressions that persuading buck for intimacy meanwhile the most important oestrus expressions is the expressions that allowing penetration by buck. Prior to oestrus, does began to exhibit less important OE but as oestrus peak approached, does started to exhibit important OE which was SH. However, manifestation of OE may vary among doe after CIDR removal due to different stage of oestrus. However, during visual observation there were only 5 oestrus expressions that had been detected which were SH, MBNS, VC, TW, and SGB. These had been classified into primary and secondary OE. The only primary OE was SH while the others were classified as secondary OE. OE of each doe was recorded at different intervals following CIDR removal (24 h, 33 h, 48 h, 57 h and 72 h) and number of does exhibiting OE was presented in percentage. Number of does exhibited OE were recorded and calculated according to the following Eq. 1 (Mat et al., 2015).

$$\text{Percentage of doe exhibit oestrus expression} = \frac{\text{Number of doe exhibit oestrus expression}}{\text{Total of doe}} \times 100 \quad (1)$$

Onset of oestrus was referred as the interval between the time when CIDR was withdrawn to the first time the doe stand still and allowed buck to mount (Omontese et al., 2012). Based on recorded oestrus manifestation, onset of oestrus was determined and calculated in percentage according to the Eq. 2.

$$\text{Onset of oestrus (\%)} = \frac{\text{Number of doe start exhibited SH}}{\text{Total of does in each group}} \times 100 \quad (2)$$

2.3. Evaluation of post breeding reproductive performance

After mating, does were managed according to the usual farm routine. In the morning, does were fed with pelleted concentrate according to groups in the pen. Meanwhile, in the evening, does were released for free grazing. When doe started to deliver kids, data on post breeding reproductive performance was recorded for evaluation. Post breeding parameters that are evaluated in this study were pregnancy rate, abortion rate, mortality rate, litter size (single, twin and triplets), litter birth weight (single, twin) and gestation length. Recorded data was used in the calculation according to the Eq. 3, 4, 5 and 6 (Moaeen-Ud-Din et al., 2008; Bushara et al., 2011; Akar et al., 2014; Haldar et al., 2014). Does started to deliver kids as early as 145 days after the last day of mating and data collected was until the first doe exhibited standing heat deliver kid. During gestation period, the number of aborted

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doe had been recoded for abortion rate data. Number of kid mortality was also recorded up to 30 days after the births.

a) Pregnancy rate (%) (Akar et al., 2014)

$$= \frac{\text{Total of pregnant doe}}{\text{Total of mated doe}} \times 100 \quad (3)$$

b) Abortion rate (%) (Akar et al., 2014)

$$= \frac{\text{Total of aborted doe}}{\text{Total of pregnant doe}} \times 100 \quad (4)$$

c) Mortality rate (%) (Bushara et al., 2011)

$$= \frac{\text{Number of death kid}}{\text{Total of birth}} \times 100 \quad (5)$$

d) Litter size (Moaeen-Ud-Din et al., 2008; Haldar et al., 2014)

$$= \frac{\text{Number of kid born per doe (single,twin, triplets)}}{\text{Number of does}} \times 100 \quad (6)$$

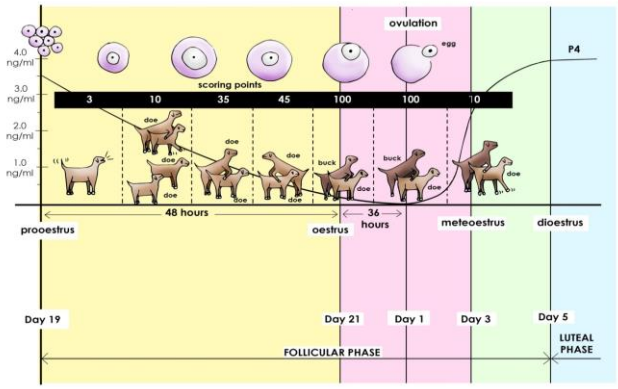

Figure 1: The intensity of oestrus expressions according oestrus cycle in doe (Adapted from Gray and Varner, 1984; Van Vliet and Van Eerdenburg 1996; Perry, 2004 and Schillo, 2009).

2.4. Blood sampling

Blood samples were collected at five intervals: 24 h, 33 h, 48 h, 57 h and 72 h after CIDR removal in order to identify trending of progesterone hormone (Khanum et al., 2008). Blood were drawn from jugular vein by using 21 G (1 ½") vacutainer needle attached to the holder that cleaved to the plain tube (Salleh et al., 2014). Blood samples were transported to the laboratory for serum separation. The blood samples were allowed to clot for at least 60 minutes at room temperature securely. Then followed by centrifuged at 2000xg for 10 minutes in refrigerated centrifuged. The clear liquid layer, which is the serum, was transferred into a sterile polypropylene tube by using Pasteur pipette. Polypropylene tubes which contained serum were stored in micro centrifuge box and freezed at -20℃ (BioSource, 2007).

2.5. Progesterone analysis

Progesterone serum were analysed according to manufacturer's protocol. Stored serum samples were thawed for progesterone concentration analysis. The microplates of specific goat progesterone (PROG) ELISA kits (Cusabio ®, China), were used for this analysis. The standards and samples were place onto the well plate, HRP-conjugate were added to each well except for blank well. Then, the samples were mixed well and incubated for 60 minutes at 37℃. Afterwards, each well was aspirated twice with a total of three washes by occupying well with wash buffer. Subsequently, substrate A and B were place into each well and incubated for 15 minutes without light exposure at 37℃. Finally, stop solution was added into each well and the analysis was carried out by using microplate reader (iMark microplate absorbance reader, Bio Rad).

2.6. Statistical analysis

The effect of parity and BCS on oestrus expressions (SH, MBNS, VC, TW, SGB) were subjected to chi-square analysis at 95% confidence interval. In addition, statistical analysis of post breeding reproductive performance of pregnancy rate, abortion rate, mortality rate and litter size were analysed by chi-square test at $P<0.05$. Meanwhile, gestation length and litter birth weight were subjected to t-test analysis at $P<0.05$. Analysis of serum progesterone concentration according to parity and BCS were evaluated by using General Linear Model (GLM) procedure. All of the data were analysed under SPSS software version 23.

3. RESULTS AND DISCUSSION

Two does were discarded following reproductive performance evaluation due to absence of prominent oestrus expressions manifestation and high concentration of progesterone which indicated that does were not affected by the synchronisation treatment. A chi-square test of independence was performed to examine the relation between parity or BCS and oestrus expressions (primary and secondary). Number of does exhibited oestrus expressions were recorded and calculated into percentage of does exhibited particular oestrus expressions. The relation between parity and primary oestrus expressions (SH) was insignificant, X^2 (1, N=22) = 0.73, p>0.05 (Table 1). Furthermore, the relationship between BCS and oestrus expressions (SH) was insignificant X^2 (1, N=22) = 0.32, p>0.05 (Table 2). Secondary oestrus expressions were also unaffected by parity and BCS in Katjang crossed does. However, parity ≤2 and BCS ≤ 3.5 had greater percentage in most of the oestrus expressions especially SH compared to parity ≥3 and BCS ≥4.0.

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Table 1: Total percentage of Katjang crossbred does exhibited oestrus expressions according to its parity groups.

Oestrus expressions		Parity ≤2 (%)	Parity ≥3 (%)	*Chi-square* ($\chi 2$)	Sig.
Primary oestrus expressions	Standing heat (SH)	54.50% (6/11)	36.40% (4/11)	0.73	0.39
Secondary oestrus expressions	Mounted by buck but not standing (MBNS)	72.70% (8/11)	72.70% (8/11)	0	1.00
	Vocalization (VC)	63.60% (7/11)	54.50% (6/11)	0.19	0.67
	Tail wagging (TW)	81.80% (9/11)	90.90% (10/11)	0.39	0.53
	Sniffing of the genital of other buck (SGB)	90.90% (10/11)	81.80% (9/11)	0.39	0.53

%- Percentage, Sig.-significant

Table 2: Total percentage of Katjang crossbred does exhibited oestrus expressions according to its BCS groups.

Oestrus expressions		BCS ≤ 3.5 (%)	BCS ≥4.0 (%)	*Chi-square* ($\chi 2$)	Sig.
Primary Oestrus expressions	Standing heat (SH)	50.00% (7/14)	37.50% (3/8)	0.32	0.57
Secondary Oestrus expressions	Mounted by buck but not standing (MBNS)	71.40% (10/14)	75.00% (6/2)	0.03	0.56
	Vocalization (VC)	64.30% (9/14)	50.00% (4/8)	0.43	0.51
	Tail wagging (TW)	92.90% (13/14)	75.00% (6/8)	1.38	0.24
	Sniffing of the genital of other buck (SGB)	85.70% (12/14)	87.50% (7/8)	0.01	0.91

%- Percentage, Sig.-significant

The results of the current study found that parity did not give a significant effect either on primary or secondary oestrus expressions. The highest percentage of oestrus expressions was observed in Katjang crossbred does from parity ≤2 for SGB followed by MBNS, VC and SH. In terms of BCS, primary and secondary oestrus expressions were not affected by BCS. However, BCS ≤ 3.5 recorded the highest percentage of TW followed by SGB, VC and SH compared to BCS≥4.0. Percentage of doe exhibiting SH was lower than other secondary oestrus expressions which is also supported by previous finding of Van Vliet and Van Eerdenburg (1996) and Salleh et al., (2014). Van Vliet and Van Eerdenburg (1996) reported that SH of oestrus was 37% of the total OE observed which was lower than the results in current study. Meanwhile Salleh et al., (2014) discovered that there was no Saanen doe exhibited SH but the other secondary oestrus expressions were present. The lack of experience in lower parity did not restrict them from actively exhibiting oestrus expressions (Loya-Carrera et al., 2017). Véliz et al., (2009) reported that mounting behaviour was associated with ano-genital sniffing where buck tend to mount over does with higher frequency of ano-genital sniffing. SH was intense during 24 h following CIDR removal by does from parity≤2 and BCS ≤ 3.5 but without significant difference. This finding was in contrast to the study by Abdel Fattah and Abdel-hamid (2016) who reported that buck tend to mount over higher parity of Egyptian Baladi does due to experience and responded to air-borne chemical secreted by buck during courtship (Mat et al., 2014). Based on this finding, time of ovulation can be predicted as ovulation occurred at 36 h after SH event. It is also a valid sign of oestrus (Van Vliet and Van Eerdenburg, 1996; Leite-Browning and Browning, 2009). Therefore, it is highly recommended that the time of insemination should be approximately 60 h after CIDR removal.

Percentage of Katjang crossbred does that exhibited SH in different group of parity and BCS following CIDR removal is shown in Table 3 and 4. There were no significant difference between percentages of SH in parity at 24 h, 33 h, 48 h, 57 h and 72 h following CIDR removal, X^2 (1, N=22) = 1.22, 1.05, 0.37, 0.00, 1.05, p>0.05 correspondingly. Similar case happened in BCS groups where it was found that BCS did not caused significant effect (p>0.05) on SH expression at different period following CIDR removal. Nevertheless, the highest percentage of SH was shown in goats in parity ≤2 after 24 h and 48 h CIDR removal which at 27.3% and 18.2% respectively. Meanwhile it was observed that highest percentage of SH expressions in BCS ≤ 3.5 after 24 h and 48 h of CIDR removal at 21.4% and 14.3%, respectively.The effect of parity and BCS were not significant may be due greater influences of other factors such as weather condition and nutritional status of goat (Gimenez and Rodning, 2007). Buck effect also contributed to this finding as visual observation of oestrus expressions reported that buck had body contact with doe in a particular sequence instead of random pattern while in courtship.

Based on the guideline of oestrus expressions in Fig. 1, oestrus expressions of TS, VC, SGB and MBNS were among the oestrus expressions exhibited prior to SH. Current finding revealed that SGB, TS and VC recorded the highest percentage of doe exhibited during 24 h to 48 h following CIDR removal, where both parity and BCS did not affect the exhibition of those expressions (P>0.05). Meanwhile MBNS expression began at 33 h following CIDR removal which had been dominated by parity≥3 and BCS≤3.5 insignificantly (P>0.05).

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Table 3: Percentage of Katjang crossbred does showed standing heat in different parity groups following CIDR removal.

Hour after CIDR removal	Parity ≤2 (%) n=11	Parity ≥3 (%) n=11	*Chi-square* ($\chi 2$)	Sig.
24h	27.30% (3/11)	9.10% (1/11)	1.22	0.27
33h	0.00% (0/11)	9.10% (1/11)	1.05	0.31
48h	18.20% (2/11)	9.10% (1/11)	0.37	0.53
57h	9.10% (1/11)	9.10% (1/11)	0	1
72h	9.10% (1/11)	0.00% (0/11)	1.05	0.31

%- Percentage, Sig.-significant, n-number of samples

Table 4: Percentage of Katjang crossbred does showed standing heat in different BCS groups following CIDR removal.

Hour after CIDR removal	BCS ≤ 3.5 (%) n=14	BCS ≥4.0 (%) n=8	*Chi-square* ($\chi 2$)	Sig.
24h	21.40% (3/14)	12.50% (1/8)	0.27	0.54
33h	7.10% (1/14)	0.00% (0/8)	0.59	0.64
48h	14.30% (2/14)	12.50% (1/8)	0.01	0.71
57h	7.10% (1/14)	12.50% (1/8)	0.18	0.61
72h	0.00% (0/14)	12.50% (1/8)	1.83	0.36

%- percentage, Sig.-significant, n-number of samples

Based on the data collected on oestrus expressions, it was discovered that parity and BCS did not affect onset of oestrus in Katjang crossbred does (Table 5). Nonetheless, it can be assumed that the onset of oestrus ranged from 33 h to 36 following CIDR removal. Does in parity≤2 and BCS ≤ 3.5 had come into oestrus earlier than parity ≥3 and BCS ≥4.

Table 5: Onset of oestrus according to treatment group.

Treatment groups	N	Onset of oestrus (hour±SE)	Sig.
Parity ≤2	5	33.60±5.87	0.37
Parity ≥3	3	35.00±7.00	
BCS ≤ 3.5	6	33.50±4.80	0.56
BCS ≥4.0	2	36.00±12.00	

N-number of samples, Sig.-significant, SE-standard error

The onset of oestrus was observed after CIDR removal to first SH (Omontese et al., 2012). The present finding shows that there was no significant effect of parity and BCS on onset of oestrus. This finding is in agreement with study by Mat et al., (2015) who reported that there was no significant effect of parity and BCS on onset of oestrus in Saanen-cross. On the contrary, Lehloenya and Greyling (2010) found that parity had a significant effect on onset of oestrus of Boer goat following CIDR withdrawal. According to the result attained in this study, it was assumed that onset of oestrus was from 33 h to 36 h following CIDR removal. The period of onset of oestrus of Katjang crossbred doe was almost similar to a study of Widayati et al., (2011) who stated that onset of oestrus started at 32 h following CIDR removal.

Table 6 shows that parity and BCS did not affect progesterone concentration level in Katjang crossbred does (P>0.05). However, the concentration level dropped from the day of CIDR withdrawal until 72 h following CIDR removal. The lowest concentration in both parity and BCS groups were 0.03±0.03 ng/ml and 0.05±0.05 ng/ml by parity ≤2 and BCS ≥4.0 respectively. Figure 2 and 3 displayed the pattern of SH activity supported with progesterone concentration. Parity ≤2 and BCS ≤3.5 had lower progesterone concentration compared to parity ≥3 and BCS ≥4.0. Low concentration of progesterone was associated with higher activity of standing heat.

Table 6: Progesterone concentration (ng/ml) of Katjang crossbred does according to parity and BCS groups at different hour following CIDR removal.

N	Parity≤2 11	Parity≥3 11	Sig.	BCS≤3.5 14	BCS≥4.0 8	Sig.
Following CIDR removal	(*ng/ml ± SE*)	(*ng/ml ± SE*)		(*ng/ml ± SE*)	(*ng/ml ± SE*)	
0 h	4.71±1.99	3.42±1.61		3.00±1.37	5.92±2.47	
24 h	0.58±0.39	0.90±0.90	0.55	0.96±0.73	0.37±0.37	0.77
33 h	0.20±0.13	1.27±0.74		0.91±0.62	0.44±0.30	
48 h	0.11±0.11	0.84±0.84		0.75±0.66	0.00±0.00	
57 h	0.07±0.06	0.24±0.24		0.20±0.19	0.08±0.08	
72 h	0.03±0.03	0.23±0.23		0.18±0.18	0.05±0.05	

N-number of samples, Sig.-significant, SE-standard error

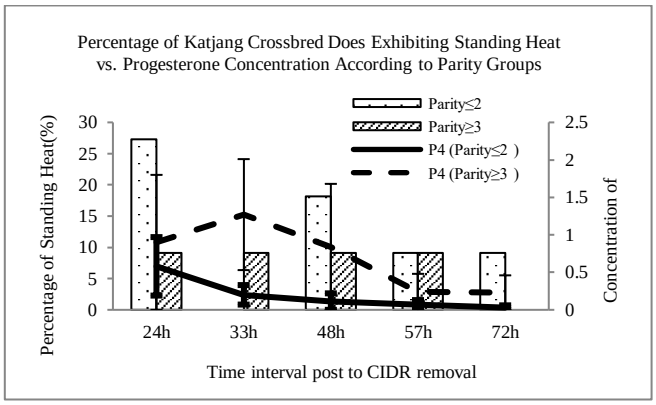

Figure 2: Pattern of standing heat activity align with progesterone concentration according to parity groups.

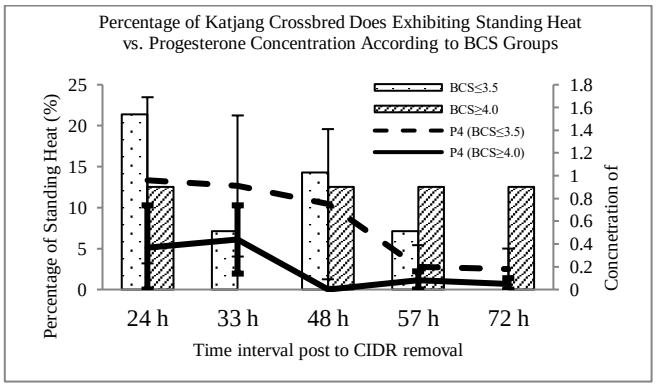

Figure 3: Pattern of standing heat activity align with progesterone concentration according to BCS groups.

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Table 7 shows that parity and BCS groups did not have a significant effect (P>0.05) on post breeding reproductive performances except for LBW in single litter size which had been affected by parity. LBW of single litter size in does of parity ≤2 (*M* = 2.36 kg, *SE* = 0.13) was significantly higher (p<0.05) compared parity ≥3 (*M* = 1.68 kg, *SE* = 0.37). PR was found equally distributed between parity groups meanwhile in terms of BCS, BCS ≤3.5 had insignificantly (P>0.05) higher rate than BCS ≥4.0. AR was higher in parity ≤2 and BCS ≤3.5. Besides, different parity also did not have significant effect (p>0.05) on PR, AR, MR, LS and GL. PR shown by both parity groups had equal percentage (72.70%). Meanwhile the AR was highest in does from parity ≤2 and BCS≤3.5 which were 9.10% and 7.10% respectively compared to parity ≥3 and BCS≥4.0 with no record of abortion. It was also found that parity ≥3 and BCS ≤3.5 had greater percentage in terms of MR. Moreover, the results revealed that both parity and BCS groups of Katjang crossbred had higher rate of single LS than twin and triplets LS. Finally, GL (d) was found longest in does in parity ≤2 (*M* = 162.29, *SE* = 11.37) as compared to does in parity ≥3 (*M* = 154.00, *SE* = 6.09). Besides, GL was also longest in does at BCS ≥4.0 at 160.50±12.55 d as compared to does at BCS ≤3.5 which at 156.91±7.28 d.

Table 7: Effect of parity and BCS on post breeding reproductive performances.

Reproductive Parameters	N		Parity≤2 n=11	Parity≥3 n=11	Sig.	BCS≤3.5 n=14	BCS≥4.0 n=8	Sig.
Pregnancy rate (PR) (%)	22		72.7% (8/11)	72.7% (8/11)	0.68	85.70% (12/14)	50.0% (4/8)	0.09
Abortion rate (AR) (%)	22		9.1% (1/11)	0% (0/11)	0.5	7.10% (1/14)	0.00% (0/8)	0.64
Mortality rate (MR) (%)	22		0% (0/11)	27.3% (3/11)	0.11	14.30% (2/14)	12.5% (1/8)	0.71
Litter size (LS) (%)	Single	9	45.5% (5/11)	36.4% (4/11)		50.00% (7/14)	25.0% (2/8)	
	Twin	5	18.2% (2/11)	27.3% (3/11)	0.69	21.40% (3/14)	25.0% (2/8)	0.44
	Triplets	1	0% (0/11)	9.1% (1/11)		7.10% (1/14)	0.00% (0/8)	
Litter Birth weight (LBW) (kg±SE)	Single	9	2.36± 0.13 (5)	1.68± 0.37 (4)	0.01	2.16± 0.18 (7)	1.70± 0.80 (2)	0.09
	Twin	5	1.33± 0.48 (2)	1.35± 0.28 (3)	0.1	1.39± 0.29 (3)	1.27± 0.45 (2)	0.35
Gestation length (GL) (d±SE)	22		162.29± 11.37	154.00± 6.09	0.11	156.91±7.28	160.50±12.55	0.81

%-Percentage, kg-kilogram, SE-standard error, N-number of samples, Sig.-significant, d-day

The present finding revealed that parity and BCS did not give significant effect on progesterone concentration. However, progesterone concentration tended to decrease from day of CIDR withdrawal up to 72 h of CIDR removal. Does was on oestrus when the progesterone concentration was 0.2 ng/ml (Thorburn and Schneider, 1972). Blood analysis revealed that Katjang crossbred does was on oestrus at 48 h onwards following CIDR removal. Widayati et al., (2011) reported that 0.07 ng/ml was the lowest concentration of progesterone which indicates the occurrence of ovulation. Current findings indicated that progesterone concentration of parity≤2 and BCS≥4.0 had lower than 0.07 ng/ml concentration at 57 h and 48 h following CIDR removal.

All of the post breeding reproductive parameters were not affected by parity and BCS except for LBW in single litter size. Does from parity ≤2 had heavier LBW of single litter size compared to does at parity ≤3. Heavier LBW contributed to a higher survivability rate where parity ≤2 had resulted in null MR compared to does in parity ≥3. In terms of BCS, does at BCS≤3.5 had greater chance of mortality. McKenzie-Jakes and Anderson (2015) and Maurya et al., (2010) suggested that breeding program was highly recommended for does with BCS 2.5 to 3.5. Thus, does from BCS≤3.5 condition needs to be maintained during gestation period as feotus require more energy and supplement for development. Besides that, mortality rate was observed to be very high in does at parity ≥3 and BCS≤3.5, whereas the individual doe that contributed to MR was from parity 4 to 5. Results from previous research found that the highest reproductive performance was recorded in parity 4 and start to decline from parity 5 (Akpa et al., 2011). However, the current finding shows that the doe reproductive performance began to decrease in parity 4 which is contrary to previous studies. Inconsistency between the studies might be due to different breeds used in the experiments.

In addition, PR trait were equal percentage in pregnant does in does in different parity while does with lower BCS shows greater PR than does with higher BCS. This event had been supported by Villa-Godoy et al., (1990) who reported that fat body condition will reduce chances of ovulation. SH is the true sign of oestrus where accuracy of pregnancy prediction was up to 50% in this study. Does were also exhibiting MBNS which allowed penetration by buck if the doe had loosen cervical (Worku,

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2015). It contributed to a greater PR than predicted earlier in the study. The current study discovered that AR was observed in does at parity ≤2 and BCS≤3.5. This suggested that younger does may experience underdeveloped reproductive system compared to older does which had already attained maturity (Amoah et al., 1996).Percentage of single LS was found higher at parity≤2 and BCS≤3.5. This finding was supported by Moaeen-Ud-Din et al., (2008) who reported that higher chance of single LS was observed in animals with parity less than 2. The type of breed had been acknowledge to influence this condition as Katjang is small-frame goats that commonly produce single LS as compared to twin. The result in this study also revealed that parity ≤2 had longer gestation period than parity ≥3. Previous study by Mellado et al., (2000) had similar finding where GL of doe reduced as the parity increased. At the end of experiment, BCS≥4.0 still exhibited SH even 72 h following CIDR removal whereas BCS≤3.5 no longer expressed standing heat. This resulted in longer GL by does at BCS≥4.0 compared to BCS≤3.5.

4. CONCLUSION

In conclusion, parity and BCS are weak factors in measuring reproductive management, fertility of doe and breeding successfulness. This might be due to small sample size and greater influence from external conditions such as weather, extreme environmental condition and farm management on animal's pre-and-post breeding reproductive performance. Nevertheless, oestrus synchronisation program with CIDR was an effective and beneficial approach to optimize the reproductive performance but internal and external condition such as animal management can influence its effectiveness. It is important to improve reproductive program in future by focusing on enhancing the fertilization rate and reducing the embryonic loss for optimum conception rate. Malaysian farmers should be aware of the factors that influencing conception rate in order to achieved optimum production. Intensive care during gestation period is recommended to reduce embryonic loss.

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REFERENCES

Abdel Fattah, A. F. and Abdel-Hamid, S. E. (2016). Behavioral and hormonal studies on Egyptian Baladi goat. *Journal of Advanced Veterinary and Animal Research*, 3(2): 160–165

Ahmad, N., Javed, K., Abdullah, M., Hashmi, A.S., Ali, A. (2014). Estrus induction in Beetal goats during low breeding season. *The Journal of Animal & Plant Science*, 25(4): 1283-1287

Akar, Y., Yüksel, M. and Ograk, Y. Z. (2014). Estrus Synchronization and Reproductive Performance under Different Protocols in an Estrus Dairy Goats, *Research Opinions in Animal & Veterinary Sciences*, 4(8): 432–436

Akpa, G. N., Dalha, C., Alphonsus, S. Y., Yakubu, H and Garba, Y. (2011). Relationship between litter size and parity of doe in smallholder goat herds in Kano and its Environs, Nigeria. *African Journal of Agricultural Research*, 6(29): 6212–6216

Amoah, E. A., Gelaye, S., Guthrie P. and Rexroad C. E. Jr (1996). Breeding season and aspects of reproduction of females goats. *Journal Animal Science*, 74: 723-728

BioSource. (2007). Plasma and serum preparation. Retrieved on September 28, 2014 from http://www.lifetechnologies.com/my/en/home/references/protocols/cell-and-tissue-analysis/elisa-protocol/elisa-sample-preparation-protocols/plasma-and-serum-preparation.html

Bushara, I., Elemam, M. B., Abdelhadi, O. M. A., Idris, A. O. and Abu Nikhiala, A. M. (2011). Effect of parity number on the productivity of Taggar goats under dry land farming in Western Sudan. *American-Eurasian Journal Agriculture & Environment Science* 10(4): 515-518

Chowdhury, S. A., Bhuiyan, M. S. A. and Faruk, S. (2002). Rearing Black Bengal goat under semi-Intensive management 1. Physiological and reproductive performances. *Asian-Australisian Journal of Animal Science*, 15(4): 477-484

Dadi, H., Duguma, G., Shelima, B., Fayera, T., Tadesse, M., Woldu, T. and Tucho, T. A., (2008). Non-genetic factors influencing post-weaning growth and reproductive performances of Arsi-Bale goats. *Livestock Research for Rural Development* 20(7)

Department of Veterinary Services (DVS) Statistics, Perangkaan ternakan 2015/2016. (2016). Retrieved on September 18, 2017 from www.dvs.com.my

Fatet, A., Maria-Teresa, P. and Bernard, L. (2011). Reproductive cycle of goats. *Animal Reproduction Science*, 124:211-219

Gimenez, D. and Rodning, S. (2007). Reproductive management of sheep and goats. Alabama Cooperative Extension System. Retrived December 22, 2017 from http://www.aces.edu/pubs/docs/A/ANR-1316/ANR-1316.pdf

Gray, H. G. and Varner, M. A. (1984). Signs of estrus and improving detection of estrus in cattle dairy integrated reproductive management. Dairy Integrated Reproductive Management, Northeast (6)

Haldar, A., Pal, P., Datta, M., Paul, R., Pal, S. K., Majumdar, D., Biswas, C. K. and Pan, S. (2014). Prolificacy and its relationship with age, body weight, parity, previous litter size and body linear type traits in Katjang crossed goats. *Asian-Australisian Journal of Animal Science*, 27(5): 628-634

Hamed, A. (2010). Factors affecting reproductive performances of Zarabi goats. *Egyptian Journal of Sheep & Goat Sciences*, 5(2): 35-55

Jalilian, M. T. and Moeini, M. M. (2013). The effect of body condition score and body weight of Sanjabi ewes on immune system, productive and reproductive performance. *Acta agriculturae Slovenica* 102(2): 99-106

Khanum, S. A., Hussain, M. and Kausar, R. (2008). Progesterone and estradiol profiles during estrous cycle and gestation in Dwarf goats (Capra Hircus). *Pakistan Veterinary Journal*, 28 (1): 1-4

Lehloenya, K. C. and Greyling, J. P. C. (2010). The ovarian response and embryo recovery rate in Boer goat does following different superovulation protocols, during the breeding season. *Small Ruminant Research*, 88: 38-43

Leite-Browning, M. L. and Browning, R. J. (2009). The estrous cylce in cattle. *Alabama Coorperative Extension System.* Extension Alabama A&M and Auburn Universities

Loya-Carrera, J. A., Ramírez, S., Terrazas, A., Hernández, H., Vielma, J., Duarte, G. and Fernández, I. G. (2017). Sexually inexperienced anestrous goats are able to exhibit sexual behaviours exposed to sexually active bucks. *Journal of Animal Behavior and Biometeorology*, 5: 64-71

Mat, K. B., Mira, B. P., Shekinah, S. V., Rusli, N. D., Hasnita, C. H. and Ahmad Fuad, I. S. (2015). Preliminary study on influence of parity and Body Condition Score (BCS) on estrus response and conception rate of Saanen-Cross by estrus synchronization with CIDR. *Advances in Environment Biology*, 9 (27): 307-316

Mat, K. B., N. D. Rusli, B. M. Mohd and C. H. Hasnita, 2014. The potency of bull exposure in improving reproductive performance in dairy cows. *Journal of Applied Science and Agriculture*, 9(15): 36-42.

Maurya, V. P., Prince, L. L. L., Sejian, V., Kumar, D., Joshi, A. and Naqvi, S. M. K. (2010). Relationship of Body Condition Score with productive and reproductive efficiency of Avikalin ewes. *Indian Veterinary Journal*, 87 (2): 189-190

eISSN Number: 2462-2389

McKenzie-Jakes, A. and Anderson, L. (2015). Module 13: Reproduction Management in Small Ruminants. Florida A&M University, Perry Paige, Tallahassee

Mellado, M, Amaro, J. L., Garcia, J. E., Lara, L. M. (2000). Factors affecting gestation length in goats and the effect of gestation period on kid survival. *The Journal of Agricultural Science*, 135 (1): 85-89

Moaeen-Ud-Din, M., Yang, L. G., Chen, S. L., Zhang, Z. R., Xiao, J. Z., Wen, Q. Y. and Dai, M. (2008). Reproductive performance of Matou goat under sub-tropical monsoonal climate of Central China. *Tropical Animal Health and Production*, 40(1): 17-23

Omentese, B. O., Rekwot, P. I., Makun, H. J., Ate, I. U. and Rwuaan, J. S. (2012). Induction of estrus in Sahel goats using Fluorogestone Acetate (FGA) Sponges and Equine Chorionic Gonadotrophin (ECG). *Sokoto journal of Veterinary Sciences*, 10(2): 21-25

Omontese, B. O., Rekwot, P. I., Ate, I. U., Ruwaan, J. S. and Makun, H. J. (2013). Estrus behaviour and conception rates of Red Sokoto goats following treatment with Equine Chorionic Gonadotrophin and Prostaglandin. *Nigerian Veterinary Journal*, 34 (4): 906-911

Perry, G. (2004) Detection of standing oestrus–in cattle. South Dakota State University Cooperative Extension Service USDA. Retrieved on March 21, 2017 from http://agbiopubs.sdstate.edu/articles/FS921B.pdf

Salleh, S. M., Yaakub, H. And Panadam, J. M. (2014). Progesterone and Lutenising Hormone profile of Saanen Crossbred goats synchronised with CIDR and PMSG. *Malaysian Journal Animal Science* 17(1):95-102

Schillo, K. K. (2009). Reproductive Physiology of mammals from farm to field and beyond. United States of America: Department of Animal and Food Sciences, University of Kentucky, Lexington, Kentucky. Delmar Cengage Learning

Syahirah, M.Y., Mat, K.B., Rusli, N.D. and Hasnita C.H., (2016). Preliminary study on birth weight and pre-weaning growth pattern in crossed Boer kids. *Journal Tropical Resources Sustainable Science* 4, 6-9

Thorburn, G. D. and Schneider, W. (1972). The Progesterone concentration in the plasma of the goat during the oestrous cycle and pregnancy. *Journal of Endocrinology*, 52(1), 23-36

Van Vliet, J. H. and Van Eerdenburg, F. J. C. M. (1996). Sexual activities and estrus detection in lactating Holstein cows. *Applied Animal Behaviour Science* 50(57-69). Retrieved March 2016, from Elsevier database

Véliz, F. G., Meza-Herrera, C. A., De Santiago-Miramontes, M. A., Arellano-Rodriguez, G., Leyva, C., Rivas-Muñoz, R. and Mellado, M. (2009). Effect of parity and progesterone priming on induction of reproductive function in Saanen goats by buck exposure. *Livestock Science*, 125: 261-265

Villa-Godoy, A., Hughes, T. L., Emery, R. S., Stanisiewski, E. P. and Fogwell, R. L. (1990). Influence of energy balance and Body Condition on estrus and estrous cycles in Holstein heifers. *Journal of Dairy Science*, 73: 2759-2765

Widayati, D. T., Suharto, K., Asuti, P. and Junaidi, A. (2011). The effect of Body Condition Score on hormonal and vaginal histological changes during estrus of synchronized Etawah cross bred does. *International Journal of Biological, Biomolecular, Agricultural, Food and Biotechnological Engineering*, 5(5): 301-303

Worku, B. (2015). Assesment of breeding practices and evaluation of estrus synchronization and mass insemination technique in dairy cattle in West Shoa Zone. Haramaya University: Ethiopia

eISSN Number: 2462-2389