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POSTPARTUM INTERVAL TO ESTRUS OF SUMATERA CROSSBRED SHEEP UNDER CONFINEMENT

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ABSTRACT

A study was conducted to investigate the occurrence of estrus after parturation in Sumatera x St. Croix x Barbados Blackbelly (Composite Sumatera, COM, n= 42) and Sumatera x Barbados Blackbelly (BC, n=24) crossbred sheep that were housed intensively. Each pen consisted of 6 ewes. Animals received isoenergy (68% TDN) and isoprotein (16% crude protein) concentrate and chopped King grass, and water was supplied *at libitum* The study was started on day 20 after the lambing, where ewes were estrus checked twice daily. The onset of estrus was identified as the time where ewes showed full estrus behaviour signs and received rams. The parameters being observed were postpartum estrus (days), ewe weight and lambs weight. The data were analysed using General Linear Model, where the dependent variables were postpartum interval to estrus, ewe and lambs body weight. The independent variables were of ewes genotype, eweage, feeding regimes and litter size. There was no significant effect of sheep genotype, ewe age, feeding regimes and litter size on the onset of estrus, with the average postpartum interval to estrus of 74.63±7.7 days. The range of postpartum interval to estrus duration for the ewes was 29 - 114 days, with the highest frequency (70.7%) of ewes came to heat on day 63 - 79. The body weight changes of ewes during lactation was significantly affected ($P<0.05$) by ewe age, but not by breeds of sheep, feeding regimes and litter size with average of – 3.4 kg head^{-1} lactation^{-1} Total birth weight of lambs was significantly affected ($P<0.05$) by litter size and ewe age, but not by breed and feeding treatment, with average of 3.8 kg. Total weaning weight of lambs was significantly ($P<0.05$) affected by litter size with average of 15.2 kg. The duration of postpartum interval to estrus will decide the remating of the ewes and overall decide the lifetime production of the ewes.

Key Words: Estrus, Parturation, Crossing

INTRODUCTION

A crossing between local Sumatera x St. Croix x Barbados Blackbelly had been conducted to create new breed of sheep adapted to humid tropic environmet of Indonesia (Subandriyo et al., 2000). The sheep in tropical humid environment required hair coat cover, decrease the heat stress. Heat stress was usually found in wooly sheep raised in tropical humid environment. The sheep composite sumatera (COM) performed better than, Barbados Blackbelly cross (BC) on growth and dam productivity.

The sexual activity after lambing was displayed after the involutary utery. In general, sexual activity parturition start to show after the involuntary process and the

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regression of endometrium were completed, where the reproduction tract returned to normal condition. The processes take place in 24 days (Hafez and Hafez, 2000) and the onset of estrus will be displayed at 10–12 days after the involuntary processed. The duration of postpartum interval to estrus is affected by several environmental, genetic, physyiologic and metabolic factors. The extent of postpartum interval to estrus depends also on the degree stimulations of mammary the dams and on nutritional status of the dams during late pregnancy and early lactation.

Suckling activities of lambs contribute to the delay of estrus. In pigs, piglets separation from sow after farrowing contributes to the resumption of estrus activity on day 14 (Thodberg et al, 2002). Earlier report showed that postpartum interval to estrus of Javanese thin tail lambs was around 79.6 days (Inounu, 1991). Sheep in Northern hemisphere showed that postpartum interval to estrus was affected by lambing season, which was around 71.8 and 74.7 days for two and three years old of Rambouillet ewes in spring, meanwhile ewes lambed in spring return to estrus 6-8 weeks later, however, ewes lambed in fall exhibited estrus cycle 8-10 weeks after (Hafez and Hafez, 2000).

The study was conducted to investigate the length of postpartum estrus in newly composed breeds of Sumatera x St. Croix x Barbados Blackbelly (COM) and Sumatera x Barbados Blackbelly crossbred (BC) that was fed different feeding regimes.

MATERIALS AND METHODS

Crossbred ewes of Sumatera x St. Croix x Barbados Blackbelly (COM) and Sumatera x Barbados Blackbelly (BC), were used for the study , about 42 and 24 heads, respectively. Ewes were housed in groups of six animals and were fed isoenergy (68% TDN) and isoprotein (16 % crude protein). Animals were fed in two treatments of :

T1: king grass + commercial concentrate of GT03 (Indofeed, Bogor)

T2: king grass + commercial concentrate of GT03 (Indofeed, Bogor) + 125 g head $^{-1}$ day^{-1} soy bean cake meal.

The commercial concentrate was composed of corn, coconut cake meal, wheat pollard and mineral mixtures. The portion of roughage to concentrate mixture was 60: 40.

To investigate the onset of estrus in ewes, a teaser ram was used twice daily , 07:00 a.m and 16:00 p.m. The observation started on day 20 post lambing. Sheep were considered to be estrus if ewes were standing still and rams mounted. Lambs suckled to the dams until weaning at 90 days of age. The variable observed were the day of estrus onset after lambing, ewe body weight and lambing, at biweekly interval until time of weaning, ewe weight changes (g head^{-1} day^{-1}) during lactation, total lambs weight at parturition and total weaning weight of lambs.

Data were analysed using general linear model of SAS package (1986) with the mathematical models as follows:

$$Y_{ijkl} = \mu + B_i + P_j + U_k + \varepsilon_{ijkl}$$

where:

Y_{ijkl} = the postpartum estrus observation of the ith breeds, the jth feeding treatments and the kth ewe's age

μ = the average of parameter observed

B_i = fixed effect of the i th breed (i=1,2)

P_j = fixed effect of the jth feeding treatment (j=1,2)

U_k = fixed effect of the k th age (k=1,2...4)

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ε_{ijkl} =treatments error

Independent variables that showed significant effect, were continued by Ducan's multiple range test. Simple correlation analysis was conducted between dependent variables.

RESULTS AND DISCUSSION

Postpartum interval to estrus was not affected (P>0.05) by breeds of sheep, lambs birth type, ewe age and the feeding regimes The least square mean of postpartum interval to estrus was of 74.6 days (n = 66; CV = 24.71 %; range = 29-114 days).

The least square means of postpartum interval to estrus of sheep for Barbados Crossbred (BC) and Sumatera Composite (COM) breeds were 74.6±7.5 and 74.7±6.3 days, respectively. The result was not in agreement compared to the study of Romjali et al. (1992) using Sumatera crossbred sheep with average of 485±14.5 days of postpartum, ranging from 14-94 days with average body weight of 24.4±4.7 kg. In the previous study, breed of sheep did not contribute significantly to the onset of postpartum estrus, eventhough purebred Garut and Sumatera sheep had shorter postpartum estrus, 47.3 ±17.01 and 48.9 ±14.9 days, respectively. In this study, COM ewes exhibited estrus earlier than BC ewes (Figure 1) and most of the BC sheep came in heat at almost the same time, and COM sheep had wider range. In term of management practices, the occurrence of estrus after lambing for BC sheep is preferable than COM. The local breed of sheep in Indonesia, Inounu (1991) reported that postpartum interval to estrus of the Javanese thin tail sheep was around 79.6 days. The result of this study was shorter than of Inounu (1991), but longer than of Romjali et al. (1992). The differences could be due to different in management practices or microclimate. Romjali et al. (1992) researched in condition of semi intensive practices and sheep were grazed daily and housed at night and stimulated the release of reproduction hormones. The percentages of ewes exhibited estrus about two cycles (around 32 days) are found only for COM sheep, but not for BC ewes. The majority of ewes in this study came in heat about four to five cycles (32.6% and 38.1% for COM and BC ewes, respectively) after the lambing date. This study showed a longer interval to estrus, compared to study by Godfrey and Dodson (2003) for Barbados Blackbelly and St. Croix grazed on natural pasture vs supplemented ewes in natural pasture (33.0 ± 3.1 vs 41.1 ± 2.9 days, respectively).

The least square means of postpartum interval to estrus for ewes by types of growth, showed that triplets (81.0±19.0 d) came to estrus longer than ewes of twins (78.0±4.2 d) and singleton (72.7±2.9 d). The result was in agreement as report by Inounu (1991) for Garut sheep, that post partum interval to estrus for single type was earlier than twin typeof goat. More suckling effect of twin and triplet lambs caused post partum interval to estrus of the dams longer than single lamb. This study was much higher than report by Godfrey *et al.,* (1998) for St. Croix ewes came to heat on day 48.3±5.0 and 37.7±4.2 postpartum, having single and twin lambs, respectively. The difference could be due to different genotype of the ewes and management practices applied to the animals.

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Table 1. Analysis of variance and least square means (± s.e) of postpartum interval to estrus (day) of Sumatera x St.Croix x Blackbelly and Sumatera x Barbados Blackbelly crossbred.

Parameter	Postpartum estrus (days)
Breed	NS[1)]
1. (COM) (n=41)	74.6±7.5 [a]
2. (BC).(n-24)	74.7±6.3 [a]
Feeding regimes	NS
1	74.7±3.9 [a]
2	74.6±5.4 [a]
Ewe age (days) class	NS
1.≤ 913 : 1	75.7±8.3 [a]
2. > 913 – 1278 : 2	75.6±8.9 [a]
3. > 1278 – 1645 : 3	76.0±7.8 [a]
4. > 1645 : 4	71.7±6.8 [a]
Type of birth:	NS
1. single	72.7± 2.9 [a]
2. twins	78.8± 4.2 [a]
3. triplets	81.0±19.0 [a]

[1)]**NS :non significant**
a,b :different alphabet on the same categorical subject was significantly different

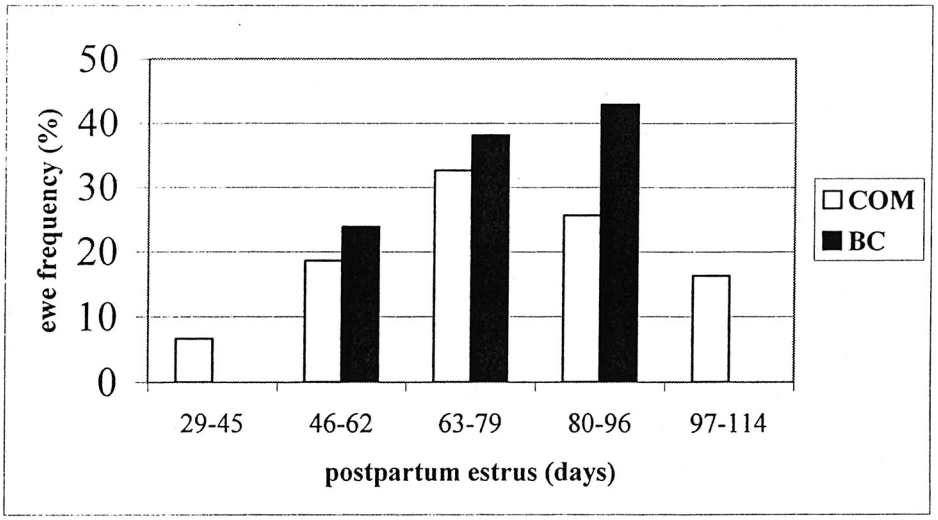

Figure 1. The frequency of ewes (%) exhibited estrus.

The least square means of postpartum interval to estrus of ewes from age class 1, 2, 3 and 4 75.7±8.3 ; 75.6±2.9; 76.5±7.8 and 71.7±6.8 days, respectively. The least square means of postpartum interval to estrus for ewes received feeding treatment 1 and 2 was 74.7±3.9 and 74.6±5.4 days, respectively. Postpartum interval to estrus was not affected by ewe weight at estreos detection, in average of 30.7±4.3 kg and 28.5±4.9 kg, respectively for COM and BC crossbred. The postpartum interval to estrus was very important to investigated because decided the remating schedule of the ewes and overall ascertain lifetime productivity. From this study, efforts should be made to shorten the postpartum interval to estrus such as early wean of the lambs, and to improve ewe body condition by offering high quality feeds. Suckling, was preventing the release of GnRH,

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FSH and LH (Hafez and Hafez, 2000). Weaning can be accelarated at week eight after lambing, then hormones responsible for milk let down will be stopped. Further, hormone responsible for reproductive and sexual activity took place, for follicle development, ovulation and sexual exhibition, ready for mating. On the other hand, hormone activity function well if ewe body weight was prime, therefore recondition body weight is another efforts to achieve.

Ewe body weight change from lambing until the end of lactation (range - 8600 to + 1000 g head^{-1} lactation^{-1}) was not significantly affected by breeds and litter size, however it was significantly affected by ewe age ($P<0.05$) with average weight change of –3.4 kg head^{-1} lactation^{-1}. The body weight changes during lactation for COM (-3.9 kg) ewes was much higher compared to BC (-2.8 kg). The feeding treatment that was given to the ewes did not contribute significantly to body weight changes during lactation, where ewes received treatment 1 loss the body weight around –3.0 kg, compared to ewes received treatment 2, which loss the body weight even higher, around –3.7 kg. Ewe body weight change from lambing until the end of lactation (was not significantly affected by breeds and litter size, however it was significantly affected by ewe age ($P<0.05$) with average weight change of –3.4 kg head^{-1} lactation^{-1}. The body weight changes during lactation for COM (-3.9 kg) ewes was much higher compared to BC (-2.8 kg). The feeding treatment that was given to the ewes did not contribute significantly to body weight changes during lactation, where ewes received treatment 1 loss the body weight around –3.0 kg, compared to ewes received treatment 2, which loss the body weight even higher, around –3.7 kg.

Table 2. Analysis of variance and least square means (± s.e) of ewe performance.

Variable	Ewe daily gain during lactation (g head^{-1} day^{-1})	Total birth weight (kg)	Total weaning weight (kg)
Breed :	**NS**[1)]	**NS**	**NS**
1. Sumatera x St. Croix x Barbados Blackbelly	-3.9±0.8 [a]	4.0±0.28 [a]	15.6±1.2 [a]
2. Sumatera x Barbados Blackbelly	-2.7±0.9 [a]	3.5±0.32 [a]	14.5±1.3 [a]
Feeding treatment :	NS	NS	NS
1. Treatment 1	- 3.1±0.8[a]	3.7±0.27 [a]	15.5±1.2 [a]
2. Treatment 2	- 3.7±0.9 [a]	3.9±0.29 [a]	14.9±1.3 [a]
Ewe age class (days) :	**P<0.05**	**P< 0.05** [2)]	**NS**
1.≤ 913	-2.4±1.1 [a]	2.6±0.3 [a]	11.9±1.4 [b]
2. > 913 - 1278	-5.7±1.0 [b]	3.9±0.3 [b]	16.1±1.3 [a]
3. > 1278 - 1645	-3.8±0.9 [a]	4.1±0.3 [b]	15.9±1.3 [a]
4. > 1645	-2.4±0.8 [a]	4.3±0.2 [b]	15.9±1.8 [a]
Type of birth :	**NS**	**P< 0.05**	**P< 0.05**
1. single	-3.5±0.4 [a]	3.2±0.1 [b]	12.8±0.5 [b]
2. twins	-3.4±0.5 [a]	4.7±0.2 [a]	18.7±0.7 [a]
3. triplets	-3.5±2.5 [a]	5.0±0.7 [a]	23.5±3.3 [a]

[1)]**NS :non significant**
[2)]P<0.05: significant effect
a,b :different alphabet on the same categorical subject was significantly different

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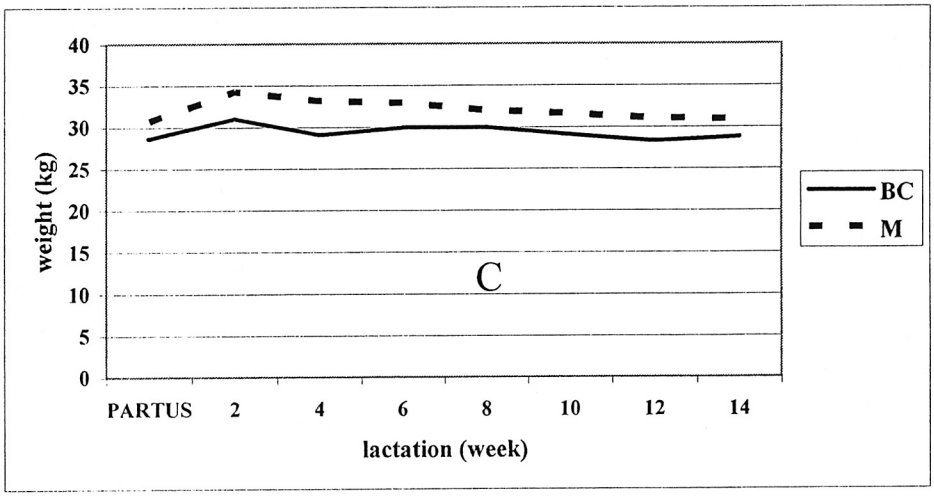
This mean that the quality of ingredients composed in the ration did not contribute signficantly to ewe weight changes during lactation (especially the ration were of iso energy and iso protein). The number of lambs born did not significantly affect to the body weight changes during lactation, ewes bearing singleton, twins and triplets lambs decrease their body weight around – 3.5 ; - 3.4 and –2.3 kg, respectively. The decrease of body weight from single bearing ewes was the highest compared to ewes bearing twins and triplets, therefore, more nutrients were needed for ewes with bearing singleton and twins. Meanwhile, ewe ageclass significantly ($P<0.05$) affected ewe body weight changes during lactation, where ewes from group 2 had the highest body weight decreased (- 5.7 kg) compared to ewes from age class 1, 3 and 4 , which was around -2.4; -3.8 and –2.4 kg head^{-1} lactation^{-1} This inconsistency was possibly because mature ewes were better maintained the body weight compared to much older ewes of > 5 years old. This was due to the fact that body weight changes of BC ewes did not decrease much compared to COM, which meant that BC ewes maintained the body weight better than COM. During lactation, most of body deposits of the ewes will be utilized for the formation of milk to be used by the lambs and to maintain their own body condition to be ready for reproductive activity. Yulistiani et al., (2003) reported that ewe body weight depletion was ranging from – 16.0 to – 64.0 g head^{-1} day^{-1} for COM sheep. This study displayed that ewe body weight loss was greater in COM (- 43.3 g head^{-1} day^{-1}) compared to BC ewes (- 30 g head^{-1} day^{-1}). Ewe body condition during lactation reflect fat utilization both for milk preursor as well as for maintaning body condition. The negative growth of the ewes meant that fat utilization was even greater than the energy supplied by the feeds.

Total birth weight was significantly affected only by ($P<0.05$) litter size and ewe age, but not by feeding treatment or breeds of sheep, with average of 3.8 kg. The average total birth weight of COM and BC sheep was 4.0 and 3.5 kg, respectively. The average total birth weight of ewes received feeding treatment 1 and 2 was 3.7 and 3.9 kg, respectively. Ewes having litter size 1, 2 and 3 had total birth weight of 3.2; 4.7 and 5.0 kg, respectively. Ewe age significantly ($P<0.05$) contributed to total birth weight, where ewes from age class 1 had the lowest total birth weight (2.6 kg), compared to ewes from age class 2 (3.9kg), 3 (4.1 kg) and 4 (4.3 kg).



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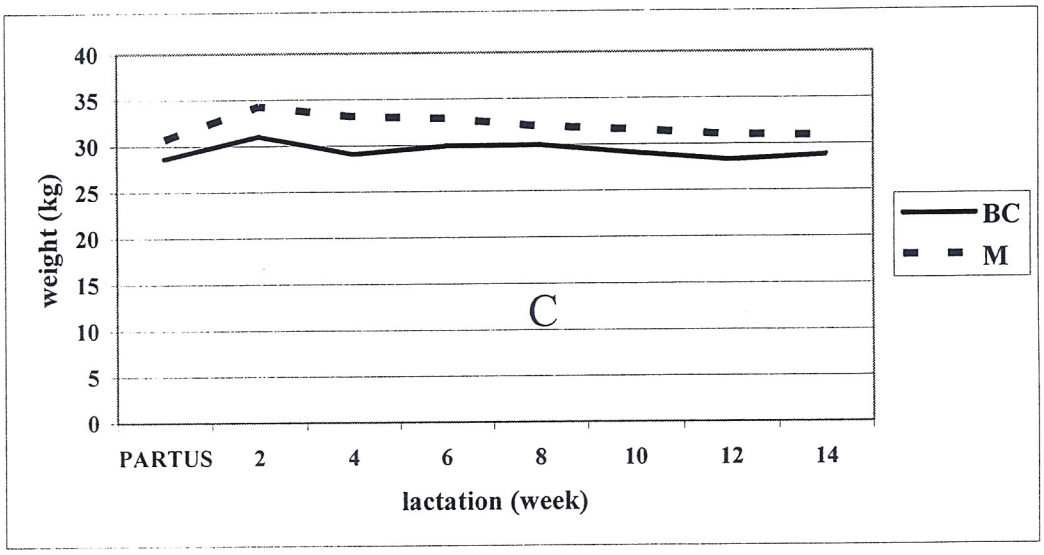

Figure 2. Ewes body weight changes during lactation.

This study showed that total birth weight of COM ewe was in agreement to Subandriyo et al., (2000) for COM and BC ewes as 4.25±0.87 and 3.76±1.03 kg, respectively. A similar result was also shown for total birth weight of ewes bearing singleton, twin and triplet, which was 3.04±0.35; 4.56±0.62 and 5.11±0.8 kg, respectively. From this study, it was exhibited that ewe performance of COM and BC was relatively similar, meant that the genetic constituent of the composite sheep has already been established. Excellent total birth weight can be achieved when ewes received sufficient feed supply especially eight weeks before lambing, due to maximum fetus growth rate, as noted in total birth weight of lambs where dams received feeding treatment 1 and 2. Total birth weight was a reflection of ewe performance which decide the lamb agrresivity to suckle and survive until weaning. The total birth weight of lambs from COM and BC ewes was not different, means that the genetic constituent of both sheep was alike, composed of hair breeds of sheep.

Total weaning weight of lambs at the end of lactation period (15.2 kg) was significantly affected ($P<0.05$) only by litter size, but not by breed, feeding treatment and ewe age. Ewes from COM had higher total weaning weight compare to BC, 15.6 and 14.5 kg, respectively. The study was in agreement of findings by Subandriyo et al., (2000) where total weaning weight of COM was not different than BC ewes, 12.6±3.14 vs 11.6±3.4 kg, respectively. The feeding regimes given to the ewes did not contribute significantly to total weaning weight, ewes from feeding treatment 1 and 2 had average total weaning weight of 15.5 kg and 14.9 kg, respectively. Litter size gave significant ($P<0.05$) contribution to total weaning weight showed that single bearing ewes had average total weaning weight of 12.8 kg, whereas ewes bearing twins and triplets had average total weaning weight of 18.7 and 23.5 kg, respectively. The younger age group (1-3 years old) had the lowest total weaning weight (11.9 kg), followed by ewe age group of 4 (15.9 kg), ewe age class 3 (15.9 kg) and ewe age class 2 (16.1 kg). Total weaning weight of lambs was not different compared to report of Subandriyo et al. (2000), both for COM and BC sheep, respectively. Godfrey and Dodson (2003) reported that average weaning weight of St. Croix and Barbados Blackbelly lambs during wet season grazed in pasture was 15.4±0.4 kg, compared to dry season of 11.5±0.3 kg.

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These report demonstrated that season influenced the weaning performance of ewe. The study demonstratd that total weaning weight of COM was higher than BC sheep, meant that COM ewes performed better than BC. In general total weaning weight influenced the overall total ewes performance, and so for future lambs performance. Growth rate of postwean lambs was slightly annoyed, on account of the cessation of suckling from the dams, therefore it was necessary to provide lambs with grains or other high nutritive diets. Legume feeds can be introduced starting on week six after the parturation.

Simple correlation among postpartum interval to estrus with ewe body weight showed a negative relationship, both for ewe weight at lambing or else ewe weight at weaning time. The correlation of postpartum interval to estrus with ewe lambing weight was considered moderate (41.7 %), however the correlation with ewe weight at two weeks postpartum was stronger (53.4%), and even stronger at ewe weight at weaning (83.4%). The correlation reflected that if body weight were well, then the post partum interval to estrus was also exhibited in a proper time. Correlation between postpartum interval to estrus and total weaning weight was also investigated to be positive and very strong (76.8%). Simple correlation among ewe weight gain during lactation and ewe body weight at lambing was positive,and even at any body weight measurement during lactation. The relationship of lambing weight and body weight at first month of lactation was 41.7 and 53.4 %, respectively and weaker at the end of the lactation periods. Romjali et al., (1992) reported that post partum interval to estrus was not affected by breeds, eventhough the body weight contributed significantly. Correlation among ewe body weight during lactation and lambs total birth weight and total weaning weight was negative, wich was 74.8 and 53.9%, respectively. Those correlation reflected ewe body weight as a strong indicator to initiate reproductive activity in ewes, regardless of breed.

CONCLUSION

1. Postpartum interval to estrus in COM and BC sheep was not significantly different with an average of 74.6days.
2. Body weight changes of ewes during lactation showed a depletion for up to – 3.7 kg $head^{-1}$ $lactation^{-1}$
3. Correlation among ewe body weight at different lactation days versus post partum interval to estrus and correlation among ewe wight gain during lactation with ewe weight showed that ewe body weight at lambing and subsequent after as an important factor to initiate reproductive activity.

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