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Effect of Progersterone Dose and Intravaginal Sponge Diameter on Reproductive Performance of Induced-Estrous Local Ewes in West Java

Soeparna Soeparna	Laboratory of Animal Reproduction, Faculty of Animal Husbandry, Universitas Padjadjaran Jl. Raya Bandung Sumedang KM 21. Sumedang West java. Indonesia
Rangga Setiawan	Laboratory of Animal Reproduction, Faculty of Animal Husbandry, Universitas Padjadjaran Jl. Raya Bandung Sumedang KM 21. Sumedang West java. Indonesia
Siti Darodjah	Laboratory of Animal Reproduction, Faculty of Animal Husbandry, Universitas Padjadjaran Jl. Raya Bandung Sumedang KM 21. Sumedang West java. Indonesia
Tita Damayanti Lestari	Laboratory of Animal Reproduction, Faculty of Animal Husbandry, Universitas Padjadjaran Jl. Raya Bandung Sumedang KM 21. Sumedang West java. Indonesia

ABSTRACT

The use of estrous induction technique is able to synchronize estrous of each ewe in order to increase the reproductive efficiency of livestock. However, the success rate of this technique is very dependent on the progesterone dose and its absorbance in the body. Therefore, this study was aimed to figure out reproductive performance of local sheep induced by the combination of progesterone doses and vaginal sponge diameters. 48 local ewes were used in this study and were grouped into 12 treatment groups. The treatments consist of the combination of progesterone doses (20, 30, and 40 mg) with vaginal sponge diameters (1, 2, 3, and 4 cm). The method used a randomized block design and the measured variables were: estrous response, pregnancy rate, litter size, and birth weight. The result showed that the highest estrous responses of the ewes were from the combination of sponge diameter 4 cm in all variation of progesterone doses. Meanwhile, the best pregnancy rate was found in the group of 20 and 30 mg progesterone dose in the diameter of 2 cm. However, this study did not find any difference among groups for litter size and birth weight. In conclusion, estrous induction using progesterone is effectively to synchronize estrous phase and pregnancy period of ewes, although it does not effect on litter size and birth weight of lamb.

KEYWORDS Local ewes, Estrous Synchronization, Progesterone, Sponge diameter

INTRODUCTION

Estrous induction is an effective and efficient technique to increase pregnancy rate in ewes. Through this technique, pregnancy and lambing time, even age of the lamb could be uniformed, therefore the farmer can easily plan the management and production. Some researchers stated that pregnancy rate after estrous induction reached 75-80% (Koyuncu and Altıcekic 2010; Santos et al., 2011; Zonturlu et al., 2011).

In principle, estrous induction using hormones is to manipulate estrous phase either by prolonging or shortening luteal phase (Iida et al., 2004; WIldeus, 1999). In the present study, progesterone was used to induce estrous by prolonging luteal phase. Based on several studies (Robinson, 1976) reported that the success of using progesterone for estrous induction yielded > 90 % within 48 hours after sponge removal. However, the report also stated that the dose of progesterone must be fit to body condition of the animal. A lower dose of progesterone tends to an un-uniformity of estrous. Another study also reported that level of progesterone has a positive correlation with estrous occurrences (Allison and Robinson, 1970). They stated that it might be due to the effect of body weight physiologically responses the induction.

Indonesian local sheep has body weight ranged of 25-30 kg. This body weight is lower if compared to sheep in subtropical area which is has body weight around 40 – 45 kg (Simonetti et al., 1999). Furthermore, a study from (Rubianes et al., 1999) stated that the use of progesterone dose in sub-tropical sheep approximately 60 mg. This implies that an appropriate dose of progesterone is an important factor in the effectiveness of estrous induction and it is differ from animal to animal dependent on the body condition and their environmental condition. Therefore, this study was to figure out a dose of progesterone in estrus induction which is fit to a local sheep and variation of vaginal sponge diameter was included in this study to find out the best absorbance of hormone during the induction.

MATERY AND METHOD

In this study, 48 non-pregnant ewes were used and grouped into three different groups of progesterone dose, i.e. 20, 30, and 40 mg. Each group was then divided into four different of vaginal sponge diameter groups (1,2,3, and 4 cm of diameter), so the experimental design was a 3 x 4 factorial to study the effect of the treatments on estrous response, pregnancy rate, litter size, and birth weight. The sponge contained different progesterone doses were inserted into vagina and kept for 14 days. After 14 days of treatment, the sponges were removed. The method of this study used a randomized block design and was followed by Fisher's LSD (Least Significance Different). The measured variables were estrous response, pregnancy rate, litter size, and birth weight. Estrous respond was monitored every day and measured by using Draminsky's

estrous detector for sheep. Estrous occurrence also defined based on cervical opening and this is indicator for artificial insemination as well (Kershaw et al., 2005). Pregnant ewes were defined using Draminsky's pregnancy detector.

RESULT AND DISCUSSION

Estrous Response is showed in Figure 1.

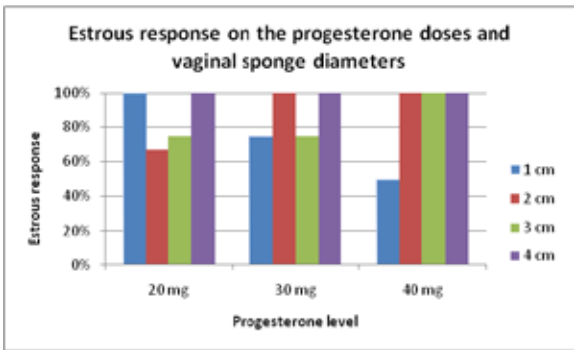

Figure 1. Estrous response on the progesterone doses and vaginal sponge diameters

According to Figure 1. Each group showed estrous signs after the removal of vaginal sponge. The signs is based on vulva characteristics, vaginal mucus measured by estrous detector, and cervix dilatation as an indicator for insemination according to (Kershaw et al., 2005). The result showed that estrous begins from day-1 to day-3 after the removal of vaginal sponge. The percentage of estrous at day-1 is relatively low for all groups, however, this finding is higher than that finding of (Ciptadi, 2010) who found no estrous animal at day-1 after the induction. The reason for this result might be due to the level of progesterone in the blood circulation is still relatively high. This condition leads to the negative feedback mechanism inhibiting Follicle Stimulating Hormone (FSH). The further effect of this inhibition causes retardation of follicle growth and estrogen production, therefore the female does not show estrous signs (Robinson and Kendrick, 1992).

Estrous response is increased at day-2 and day-3 after removal, in the ranged of 50-70% and 25-75%, respectively. This results are lower compared to the result of (Zonturlu et al., 2011) who reported that the responses at day-2 is 81-92%. (Luther et al., 2007) also reported that in general, estrous response using vaginal sponge is 75%. A hundred percentages of estrous response is reported in another finding, but the estrous induction used $PGF_2\alpha$ and 400 IU of PMSG after progesterone treatment (Ataman et al., 2006). These findings indicate that the level of progesterone in the blood stream has been decreased which furthermore leads to the growth of follicle caused by the release of FSH. Along with follicle growth, estrogen secretion increase due to the proliferation of granulose cell causing the female estrous (Hafez, 1993).

Pregnancy rate is showed in Figure 2.

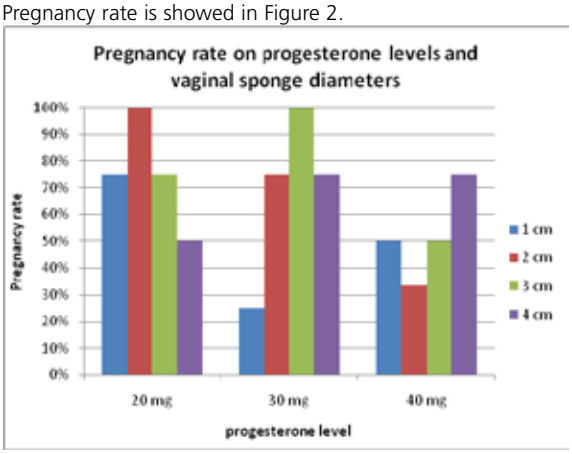

Figure 2. Pregnancy rate on progesterone levels and vaginal sponge diameters

The pregnancy rate of the ewes in all groups was recorded to compare the effect of the treatments (Fig. 2). Fig. 2 shows the combination of progesterone 20 mg and sponge diameter 2 cm; and progesterone 30 mg and sponge diameter 3 cm give 100% of pregnancy rate. These indicate that both of progesterone levels of 20 and 30 mg are optimum doses to stimulate hormonal mechanism in relation to estrous induction and ovulation. Combination of sponge diameter 2 cm and 3 cm are ideal combination as the size is fit to the vaginal space capacity of local sheep, therefore these sponges give best hormone absorption.

The lowest rate of pregnancy belongs to the group with dose 40 mg of progesterone. This result is slightly similar with the previous research used 60 mg of progesterone yielded 45% of pregnancy rate (Yadi et al., 2011). A similar result also found in (Awel and Eshetu, 2009) who used a high level of progesterone with a low pregnancy rate. The reason to address these facts that the use of high level of progesterone gives side effect on the semen transportation in the female reproductive tract (Dogan and Nur, 2006), and can caused embryonic death (Cam and Kuran, 2004). Furthermore, (Dixon et al., 2006) reported that a low dose of progesterone generate good ovulatory follicle, and pregnancy rate has negative correlation with follicle growth and progesterone dose. However, biological architecture underlying this mechanism needs to be revealed to give a better understanding.

Litter size.

Table 1. litter size of induced-estrous local sheep

Progesterone level (mg)	Diameter of vaginal sponge			
	1 cm	2 cm	3 cm	4 cm
20	1,0 ± 0,0	1.7 ± 0,47	1,0 ± 0,0	1,0 ± 0,0
30	2,0 ± 0,0	1,0 ± 0,0	1.7 ± 0,9	1.3 ± 0,47
40	1,0 ± 0,0	2,0 ± 0,0	1,0 ± 0,0	1.7 ± 0,47

Overall, out of 23 estrous-induced ewes giving a birth, 15 ewes have singletons, seven ewes have double, and one has triple. However, litter size in this study did not differ significantly among all groups. This result is in accordance with those reported by (Bitaraf et al., 2007) that estrous induction using CIDR, vaginal sponge, and cloprostenol do not significantly effect on litter size.

Birth weight

Table 2. Birth weight of induced-estrous local sheep

Progesterone level (mg)	Diameter of vaginal sponge			
	1 cm	2 cm	3 cm	4 cm
20	2.8 ± 0.25	2.4 ± 0,12	3,0 ± 0,00	2.9±0,00
30	1.8 ± 0,00	2.5 ± 0,37	2.5 ± 0, 25	2.5±0,70
40	2.8 ± 0,00	2.8 ± 0,00	NA	2.2 ± 0,27

In general, birth weight of this study ranged 1.8 to 3 kg (Table 2.). The lowest of birth weight belongs to the group of progesterone 30 mg combined with vaginal sponge 1 cm, and the highest of litter weight belongs to the group of progesterone 20 mg combined with vaginal sponge 3 cm, however, there were no significant differences among all groups. This result is in accordance with those resulted by (Anilkumar et al., 2010) that estrous induction does not effect on birth weight of lamb.

Table 3. Birth weight based on type of birth

	Total	Birth weight (kgs)
n of ewes	23	
Type of birth		
Single	65% (15/23)	2,6 ± 0,43
Double	30% (7/23)	2,2 ± 0,34
Triplet	4,1% (1/23)	2,17 ± 0,43

Lambing weight based on type of birth (single, twins, and triplets) of estrous-induced local sheep is listed in Table 3. Twins and triplets have lighter birth weights (2.2 ± 0.34 and 2.17 ± 0.43 kg, respectively) compared to single (2.6 ± 0.43 kg). This finding is lower compared to the finding by (Yilmaz and Altin, 2011) in local sheep crossed. This implies that litter size has a negative correlation with birth weight of lamb.

CONCLUSION

1. Estrous synchronization using progesterone in vagina sponge is able to synchronize estrous at the same time in local ewes
2. Vagina sponge with 4 cm diameter give the best estrous response in all doses of progesterone combination
3. Progesterone doses of 20 and 30 mg give the best result in pregnancy rate
4. Combination of progesterone dose and sponge diameter does not affect to the litter size and birth weight of local sheep

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