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Abstract
This study aimed to evaluate the efficacy of intra-vulvo submucosal prostaglandins compared to PMSG and hCG on the period of estrous signs and pregnancy rate in goats. A total of 18 goats were assigned to three groups i.e., (T1) injected 4 mg of prostaglandin, (T2) injected 4 mg of prostaglandin followed by a combination of PMSG 200 IU and hCG 100 IU, (T3) injected 4 mg of prostaglandin followed by a combination of PMSG 400 IU and hCG 200 IU. In result, on the time of onset of estrous period, there was no significant difference between the T1, T2 and T3 groups. Meanwhile, the pregnancy rate in goats also showed similar results between the T1, T2 and T3 groups. In conclusion, the intra-vulvo submucosal injection of prostaglandins was reported to have the similar effectiveness as PMSG and hCG to improve the estrous cycle and pregnancy rate in goats.

Key words: farmed animals, prostaglandin, estrous, goat
Goats are one of the strategic farming animals as a source of the economy of rural communities and are reared with traditional management (Lawal-Adebowale, 2012). Signs of estrous in goats depending on the season and the cycle can be controlled using estrous synchronization. Estrous synchronization is one way to regulate reproduction in farming animals (Lane et al., 2008). Pregnant mare serum gonadotrophin (PMSG) and human chorionic gonadotropin (hCG) hormones have been widely reported to have success rates of estrous synchronization (Kutzler, 2005). However, the use of prostaglandins is also considered for its efficacy in obtaining a significant estrous period (Fierro et al., 2013). In practical applications, it is necessary to evaluate the field of application of prostaglandins through a shorter route to the ovary, through the intra-vulvo submucosal compared to intramuscular (Wentz et al., 2007).

The present study aimed to evaluate the efficacy of intra-vulvo submucosal (IVSM) prostaglandins compared to PMSG and hCG intramuscularly which were observed in the variable period of estrous signs and pregnancy rate in goats.

Materials and Methods

A total of 18 goats used in the study were assigned to three groups. (T1) injected IVSM prostaglandin (Lutalyse™, Pharmacia & Upjohn Company, Prizer Inc.) dose of 4 mg 11 days apart, (T2) injected IVSM prostaglandin dose 4 mg followed by intramuscular injection of a combination of PMSG 200 IU 8 days apart and hCG 100 IU 14 days apart, (T3) injected IVSM prostaglandin dose 4 mg followed by intramuscular injection of a combination of PMSG 400 IU 8 days apart and hCG 200 IU 14 days apart. The treatment period was carried out according to Fig.1. The onset rate of estrous in goats was calculated using a time counter from the second prostaglandin administration until they showed symptoms of estrous in the form of swelling, mucus production and discoloration of the vulva. Further, insemination was carried out then observations of pregnancy were performed using portable ultrasound on the 30th day. The duration of estrous onset was calculated and analyzed using the ANOVA test followed by Duncan’s test (p<0.05).

Results and Discussions

Based on the evaluation of the time of onset of estrous symptoms, it can be reported that there was no significant difference between the T1, T2 and T3 groups (Table I). These results indicated that IVSM prostaglandin injections without PMSG and hCG injections can be implemented during estrous synchronization. In addition, the effectiveness of pregnancy in goats also showed similar results between the T1, T2 and T3 groups. Pregnancy was confirmed by ultrasound evaluation on day 30 (Fig.2).

PMSG administration did not have a significant effect on the onset of estrous. In this study, it revealed a shorter time compared to the results of the study by Habeeb et al. (2019) which reported the time of onset of estrous between 24-48 hours. The release of progesterone after prostaglandin administration occurs within a brief period, in the luteal phase where the corpus luteum phase varies in respective animal (Rivas-Muñoz et al., 2021). The mechanism of action of prostaglandins is by regressing the corpus luteum thereby reducing the secretion of progesterone and the estrous cycle which begins with the growth of follicles in the ovaries. This mechanism can occur due to prostaglandins inhibit blood flow to the corpus luteum. Differences in the size of the corpus luteum will result in different concentrations of progesterone. The larger the size of the corpus luteum will produce a higher concentration of progesterone (de Tarso et al., 2018). The high concentration of progesterone will affect the secretion of gonadotropin-releasing hormone (GnRH) by the hypothalamus which will continue to the difference in concentrations of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) produced by the anterior pituitary. The difference in concentrations of FSH and LH will affect the development and maturation of follicles in

Table I: First sign of estrous identification period (hours)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean±Standard deviation</th>
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<tbody>
<tr>
<td>T1</td>
<td>24.32± 2.19</td>
</tr>
<tr>
<td>T2</td>
<td>22.22± 1.45</td>
</tr>
<tr>
<td>T3</td>
<td>22.28± 1.58</td>
</tr>
</tbody>
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Similar superscripts in the same column indicate no significant differences (p>0.05).
the process of folliculogenesis, therefore estrogen will have a significant effect on the onset of estrous symptoms (Graham and Scott, 2018).

Prostaglandin injections followed by PMSG in goats can increase pregnancy rates to above 90% (Ashour et al., 2018). This study reported a higher percentage compared to research conducted by Dogan et al. (2018) which stated that the administration of prostaglandins followed by PMSG was only 88.9%. PMSG injection may affect the success rate of fertility and pregnancy in goats. The PMSG hormone has activity like FSH which can increase follicular development and slightly resembles LH activity so that it slightly affects the occurrence of ovulation. Increased follicular development due to PMSG administration will allow an increase in the number of follicles (Behringer et al., 2018).

Since goats return to oestrus within 3 days of the first treatment and are then around day 8 of the oestrous cycle at the time of the second treatment, they should all be able to have their cycles controlled by giving them prostaglandin IVSM injections 11 days apart. That goats respond to prostaglandin treatments between days 5 and 17 of the oestrous cycle is in line with past results (Simões, 2016). The interval between a prostaglandin injection and the start of oestrus would seem to be longer for treatments given in the middle of the cycle than for treatments given at the beginning. When prostaglandins are administered early in the cycle, the reason for shorter intervals to oestrus is unknown, but as in cattle and sheep, it’s possible that they are related to the phenomenon of short cycles in goats and mid-cycle follicular growth on days 6 to 8 (Tospitakkul et al., 2019).

The IVSM method is straightforward, does not necessitate penetration of the vaginal canal, may be administered in goats just as quickly as the IM route, and allows for the cost-effective and economical use of prostaglandins in goats. Following prostaglandins IVSM injections, the length of oestrus and the expression of oestrus symptoms are comparable to those following IM injections. This is corroborated by the information indicating acceptable goat fertility following prostaglandin IM injections.

Summary

It can be concluded that the IVSM injection of prostaglandins was reported to have the same effectiveness as PMSG and hCG hormone injec-
tions. Specifically in this study, similar efficacy was observed in accelerating the estrous cycle and pregnancy rate in goats.

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References


