Comparative efficacy of three synchronization protocols in anestrous goats (Capra hircus)

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Abstract

The goal of this experiment was to compare the effectiveness of three popular synchronization protocols, viz. ovsynch, double prostaglandin (PGF2α /PG) injections, and MAP (Medroxyprogesterone acetate) sponges, in anestrous goats. Twenty one non pregnant multiparous anestrous goats with an average body condition score (BCS = 2.5) were selected. After the last PG injection, all the goats were exposed to three fertile bucks. They were observed to be in standing estrus. For further confirmation of copulation, a vaginal cytology test was performed for the presence of sperm inside the vaginal smear. Serum estradiol (E2) peaks were also estimated by using radioimmunoassay in estrus goats. MAP sponge efficiency with respect to estrus induction was found to be superior (57%) as compared to the rest (Ovsynch14 and PG 0%) (p< 0.05). Post PG standing estrus time in ovsynch and MAP groups was recorded as 48 h and 44 ± 12 h, respectively. The double PG group totally failed to show standing estrus. E2 peak levels ranging from 11-38 pg/ml in ovsynch and 10–25 pg/ml in the MAP group were observed in estrus goats. This study found the MAP sponge protocol most efficient for inducing estrus in anestrous goats.

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1. INTRODUCTION

Developing countries are the main hub for more than 90% of world goat population (Akar, 2013). Among these countries, India, China, Pakistan, Bangladesh, Turkey and Iran are most famous names in the list (Khan et al., 2003). In the case of Pakistan, mostly landless and poor farmer are associated with goat rearing occupation (Iqbal et al., 2008). This farming is primarily a low input demanding business that’s why it is also an attractive earning source for poor men (Muhammad et al., 2015). The tolerance for drought and harsh environmental conditions is superior in goat than other ruminants (Lebbie, 2004). Aforementioned traits spreads goat on broader range of land in the country. Goat is basically considered as meat specie in the region and due to taste, goat meat (chevon) has great demand in Asian markets (Jindal, 1984). Goat rearing for sacrifice purpose is also persistent source of income in Pakistan. Beside the cultural events due to dietary awareness the inclusion of meat or its products have been increased sharply in recent few years (Sohaib and Jamil, 2017). Nowadays increasing halal meat demand in global market has also created a great opportunity for Pakistani business men. Current demand supply gap needs to be fulfilled through intensive goat farming. To boost the production, optimized and intensified production practices are indispensable (Bashir et al., 2015). The rhythm reproductive behaviour in goat is mainly responsible for lean production period during different months of the year (Blaszczyk et al., 2004). The low breeding months (May–August) and high breeding months (September–December) have been observed round the year in country (Mehmood et al., 2011). So, the breeding seasonality is one of the reasons of the expensive meat or its shortage in Pakistan.

During the low breeding season, the count of anestrous goats increases in the flock which causes infertility problem. Infertility is also known as disease of production which specifically effects cross bred animals in intensive farming system (Dhami et al., 2015). With the growing goat production business, effective and easy to apply estrus synchronization tools are being introduced in field (Whitley and Jackson, 2004). These tools are playing important role in persistent and round the year milk and meat production (Fatet et al., 2011). Various methods like Ovsynch, Double prostaglandin (PG) and MAP (Medroxyprogesterone acetate) sponge synchronization have been experimentally confirmed for improvement of reproductive performance in local goat breeds (Kausar et al., 2009; Riaz et al., 2012). Acquaintance with the comparative efficacy and standing estrus time related to the aforesaid synchronization protocols in anestrous goats is scanty. Keeping in view of goat farming in Pakistan, this preliminary study was designed to compare the efficacy of

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three synchronization protocols and standing estrus time in anestrous goats.

2. MATERIALS AND METHODS

2.1. Study location and animal management

This study was performed during the months of February-March, 2016 at NIAB goat farm Faisalabad, Pakistan (31°23’43.9”N 73°02’11.7”E). The conditions of the experiment conform the ARRIVE guidelines and the U.K. Animals (Scientific Procedures) Act, 1986 and EU Directive 2010/63/EU for animal experiments. Twenty one non-pregnant multiparous anestrous goats (Beetal × Dwarf goat) with average body condition score (BCS=2.5) were selected in the flock. They were randomly divided into three groups (n=7). All goats were provided with ad libitum seasonal grasses grazing and fresh clean water. Half kg (0.5 kg) concentrate was also fed per head per day.

2.2. Estrus synchronization

Three different synchronization protocols viz. Ovsynch, double Prostaglandin F2α (PG) injections and MAP (Medroxyprogesterone acetate) sponges were applied (Figure 1). Doses of GnRH and PG hormones were injected as per recommendation of Riaz et al (2012) (Table 1). Similarly progesterone sponges were prepared as described by Kausar et al (2009) and inserted for 7 days. After the last PG injection, all goats were exposed to three fertile bucks. Goats were observed for onset of standing estrus.

Table 1: Dose of drugs administered during the treatment

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Analogue</th>
<th>Dose / goat</th>
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<tbody>
<tr>
<td>GnRH</td>
<td>Lecirelin</td>
<td>12.5µ g</td>
</tr>
<tr>
<td>Prostaglandin</td>
<td>d- cloprostenol</td>
<td>37.5 µ g</td>
</tr>
<tr>
<td>Progesterone</td>
<td>Medroxyprogesterone acetate</td>
<td>60 mg</td>
</tr>
</tbody>
</table>

2.3. Vaginal cytology

For confirmation of standing estrus time (mating time), vaginal cytology was performed on every eighth hour post PG injection to confirm the presence of sperms inside vaginal smear. For staining of cytology slides, stock and then working solution of Giemsa stain was prepared (Gonzales, 2016) (Figure 2). For vaginal cytology smear, 10 cm cotton swab soaked in normal saline was inserted in vagina and rotated 2–3 times. Then it was withdrawal and rolled on glass slide. Smear was air dried and stained with Giemsa stain for 10 minutes (Figure 3). After drying, slides were observed for sperms presence under light microscope (40 x magnifications).

Figure 2: Preparation of Giemsa stain

Figure 3: Preparation and staining of vaginal smear slides

2.4. Hormonal analysis

For estradiol (E2), blood was collected every 12th hour starting from last PG injection till 72 h. Blood samples were drawn in disposable syringes and serum was harvested in glass tubes. After that, serum was stored on -20°C till further analysis. Samples belonging to the standing estrus goats were analyzed. E2 levels were estimated during estrus period by solid phase radioimmunoassay method using kits (Beckmen coulter, Czech Republic). The intra- and inter-assay coefficients of variation (CV) for E2 were ≤ 12.1% and ≤ 6.5%, respectively, whereas the analytical sensitivity was 6pg/ml.

2.5. Statistical analysis

All the data were arranged in Microsoft Excel®. Statistical software (Statistix® 8.1 version) was used for statistical analysis. Estrus response among the groups was computed by applying Chi-square test and significance level among different treatments was considered at p≤ 0.05.

3. RESULT AND DISCUSSION

Estrous cycle is mainly under the control of different hormones meant for providing repeated chances to a female to get conceived (Fatet et al., 2011). Understanding of breeding time in any synchronization protocol could be very helpful tactic to enhance its efficacy in control breeding program.

In current study, the parameters exploring the efficacy and breeding time have been listed (Table 2.), which indicated that estrus induction rate by MAP sponges
was superior (57%) in comparison with rest of two protocols (ovsynch 14 and PG 0%). Standing estrus time in MAP sponge group was recorded as 44 ± 12 h (24-72 h). Kausar et al., (2009) reported great variation in estrus time (65.4 ± 24.0) following the sponge removal in similar goat breed but that treatment was not supplemented with PG. The earlier onset might be due to PG induced luteolysis. In Saanen and Black Bengal goats, estrus onset time has been reported as range 18-96 h (Alacam et al., 1985; Ishwar and Pandey, 1990). In progesterone sponge treatment variation in estrus onset time mainly influenced by breed, co-treatment, mating scheme and environmental factors (Chemineau et al., 1999). In ovsynch standing estrus time was recorded as 48 h, which is quite similar to observation of Riaz et al (2012) as 48.0 ± 2.6 in Beetal and Dwarf breed goats. Ovsynch treated Boar goat also responded 49.3 ± 3.1 h after PG injection and showed standing estrus behavior in a previous study (Holtz et al., 2008). Whereas in double PG group none of the goats showed standing estrus in current study. In anestrous goats due to lack of ovulation (Pope et al), no corpus luteum (Pope et al) form on ovarian surface (McCracken et al., 1972). Main cause of anestrous is absence of CL or no progesterone source for priming of hypothalamus E₂ receptors responsible for estrus behavior. Poor efficiency of double PG protocol might be due the CL absence on ovaries. Poor response of non-progesterone protocols might also be due to suboptimal E₂ secretion by ovarian follicles (Husein et al., 2005).

### Table 2: Treatment response in different groups

| Parameters                      | MAP sponge | Ovsynch | double PG | p-value
<table>
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<tr>
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<tbody>
<tr>
<td>No. of goats</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Goats showed Standing estrus (%)</td>
<td>4 / 7</td>
<td>1 / 7</td>
<td>0 / 7</td>
<td>Significant</td>
</tr>
<tr>
<td>(57)</td>
<td>(14)</td>
<td>(0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last PG to standing heat time (h)</td>
<td>44 ± 12</td>
<td>48</td>
<td>-</td>
<td>Significant</td>
</tr>
<tr>
<td>(24-72)</td>
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Values are mean ± standard deviations.

Higher concentration of E₂ is an indicator of estrus onset in animals (Blaszczyk et al., 2004). E₂ peaks were observed during the estrus in goats which further endorsed the estrus phase in responded animals (Figure 3). Responded goats showed E₂ peaks ranging from 11-38 pg/ml and 10-25 pg/ml in ovsynch and MAP groups respectively. In dwarf goats, mean serum E₂ level during estrus has been reported as 7.7 ± 1.7pg/ml (Khanum et al., 2008). Peaks of E₂ indicated the emergence of large ovarian follicles in response to synchronization protocol that caused estrus onset in goats (Husein and Kridli, of buck in synchronized goats.

### REFERENCES

4. **CONCLUSION**

Progesterone priming leads to effective estrus synchronization in anestrous goat, that’s why MAP sponge synchronization must be the protocol of choice in anestrous goats. Moreover, vaginal cytology technique may also be used to detect the mating to avoid the overuse


prostaglandin F2α injections. Effect on different age groups. Theriogenology 24, 283-291.


