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Estrus Response and Conception Rate in Sangamneri and Osmanabadi Goat Does using different Estrus Synchronization Protocols

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Abstract Total 104 parous goats of Sangamneri (62) and Osmanabadi (42) breeds aged 2 - 4 years were used in this study. All goats were randomly distributed in six treatment groups. Group wise applications of hormones used for the estrus synchronization and controlled breeding protocols including both breeds of goat were as under: Group I- Two dosages of Inj. $PGF_2\alpha$; Group II -Intra-vaginal sponges + Inj. eCG i.m. on the day of sponge removal; Group III -Intra-vaginal sponges + Inj. $PGF_2\alpha$ i.m. 24 h prior to sponge removal + Inj. eCG i.m. on the day of sponge removal; Group IV- Intra-vaginal sponges + Inj. GnRH i.m. 24 h prior to sponge removal; Group V -Intra vaginal sponges + Inj. GnRH (i.m.) on the day of sponge removal; Group VI Intra-vaginal sponges + Inj. eCG (i.m.) 24 h before sponge removal. The percentage of goats exhibiting estrus from sponge withdrawal or from the end of treatment for treatment Groups I, II, III, IV and V in Sangamneri goats were 66. 67, 100, 100, 100, 91.67 % and in Osmanabadi goats as 69.23, 100, 100, 100, 57.14 %, respectively. One Sangamneri goat in Group IV exhibited estrus for seven days after sponge removal. Estrus response was 100 % for both Sangamneri and Osmanabadi breeds of goats subjected to estrus synchronization belonging to treatment Groups II, III and IV. The overall percentage of goats exhibiting estrus following different synchronization protocols were 89.28 % and 83.33 %, in Sangamneri and Osmanabadi goats, respectively. The mean time of onset of estrus (h) from progestagen withdrawal for five different treatment groups in Sangamneri goats were 25.20 ± 5.50, 46.91 ± 2.53, 27.33 ± 2.26, 41.33 ± 3.53, and 48.55 ± 4.16 h, respectively and in Osmanabadi goats as 44.4 ± 3.36, 24.0 ± 6.28, 26.75 ± 4.12, 46.84 ± 3.88, and 48.0 ± 9.09 h, respectively. The overall mean interval of onset of estrus in Sangamneri and Osmanabadi goats were 37.20 ± 2.31 h and 37.08 ± 5.72 h, respectively. The mean estrus duration (h) for five different treatment groups following estrus synchronization in Sangamneri goats were 54.60 ± 4.60, 76.36 ± 7.81, 56.67 ± 5.92, 44.00 ± 7.48, and 69.27 ± 8.76 h, respectively and for Osmanabadi goats as 44.00 ± 3.46, 113.14 ± 6.65, 53.50 ± 6.63, 50.86 ± 6.69, and 51.0 ± 15.78 h, respectively. The overall mean duration of estrus in Sangamneri and Osmanabadi goats were recorded as 61.08 ± 3.51 h and 62.34 ± 5.38 h, respectively. There was variation in estrus interval among different treatment groups of both the breeds. The conception rates in Sangamneri goats were 40.00, 72.73, 66.67, 88.89, and 72.72 %,

respectively and in Osmanabadi goats in five treatment groups as 44.44, 57.14, 37.50, 71.43, 100.00 %, respectively. The overall pregnancy rate in Sangamneri goats in this study was 68.00 %, whereas for Osmanabadi goats it was 57.14 %. Out of 34 pregnant Sangamneri goats, 21 goats' kidded and 32 kids were delivered. In Osmanabadi goats 10 goats kidded out of 20 pregnant goats delivering 12 kids. The percentage of single kids, twins and triplet kids born in Sangamneri goats were 34.37, 21.87 and 3.12 percent, respectively whereas, Osmanabadi goats delivered 66.67 % single kids and 16.17 % twins. Overall kidding rate in Sangamneri and Osmanabadi breeds of goats was 63.64 % and 71.43 %, respectively. Multiple kidding rate observed in Sangamneri and Osmanabadi breeds was 47.62 % and 20.00 %, respectively. Overall litter size in Sangamneri and Osmanabadi breeds was found to be 1.52 and 1.20, respectively.

Keywords *Estrus synchronization; Intra-vaginal sponges; Osmanabadi goat; Sangamneri goat*

1. Introduction

Goats are the most conspicuous seasonal breeders among domestic farm animals. Tropical breeds of goats may cycle year around. Sexual receptivity of the female goat is limited to a short period called estrus, the period of desire. The profitability of goat keeping depends on exploitation of fertility potential. This can be achieved by using assisted reproductive technology in goats. The synchronization of estrus using timed hormonal treatments is widely used assisted reproductive technology in goat industry. It reduces the time needed for detection of estrus. Large numbers of goats can be bred in a short period. Outside the normal breeding season, synchronization has additional advantages in herds or animals where heat detection is difficult, goats may be successfully bred without requirement of heat detection. Sangamneri and Osmanabadi are well recognized dual purpose goat breeds from Maharashtra state (India) and are the backbone of economy of small and landless farmers in Maharashtra. Inspite of benefits associated with estrus synchronization; there is no information to study comparative efficacy of different hormonal methods to induce synchronized estrus. Therefore, the present study was undertaken in Sangamneri and Osmanabadi goat does implementing different hormonal methods of synchronization to induce synchronized estrus.

2. Materials and Methods

The study was conducted at All India Coordinated Research Project on Goat Improvement, Department of Animal Science and Dairy Science, Mahatma Phule Agricultural University, Rahuri Dist. Ahmednagar Maharashtra State (India). Total 104 parous goats of Sangamneri (62) and Osmanabadi (42) breeds aged 2-4 years were used in this study. Few Sangamneri and five Osmanabadi breeding bucks were used for breeding purpose during the study. All goats were randomly distributed in six treatment groups.

Group I: Two dosages of Inj. $PGF_2\alpha$ i.m. 10 days apart; Group II: Progestagen-impregnated intra - vaginal sponges kept in vagina for seven days + Inj. eCG i.m. on the day of sponge removal; Group III: Progestagen-impregnated intra-vaginal sponges kept for seven days + Inj. $PGF_2\alpha$ i.m. 24 h prior to sponge removal + Inj. eCG i.m. on the day of sponge removal; Group IV :Progestagen-impregnated intra-vaginal sponges kept for seven days + Inj. GnRH i.m. 24 h prior to sponge removal and breeding during estrus period; Group V : Progestagen-impregnated intra vaginal sponges kept for seven days + Inj. GnRH (i.m.) on the day of sponge removal and breeding during estrus period; Group VI: Progestagen-impregnated intra-vaginal sponges kept for seven days + Inj. eCG (i.m.) 24 h before sponge removal.

The reproductive parameters (as per Karaca *et al.,* 2010) recorded were as follows:

i. Estrus response: Number of goats showing estrus / total number of goats treated in each group X 100; ii. Onset of estrus (h): Interval from sponge removal to time of first estrus identification; iii.

Estrus duration (h): The time between the first and last accepted mount, within the same estrous period.

The goats those exhibited estrus following synchronization were mated at least twice with the respective breed of bucks in all five groups. Sangamneri goats in group VI were inseminated at 48 and 60 hours (fixed time A.I.) following progesterone withdrawal. All goats were scanned for pregnancy 80 days post mating with the aid of a trans-abdominal ultrasonic scanning apparatus. The response of treatment and conception rate was assessed on the basis of pregnancy diagnosis results. The other reproductive parameters recorded were: pregnancy rate, kidding rate, multiple kidding rate and litter size.

3. Results and Discussion

3.1. Estrus detection, behavioral and physical signs of estrus

Estrus detection in all the experimental goats was carried out after sponge removal and / or after end of treatment. In the present study, few goats started exhibiting signs of estrus (commencement of estrus) 12 hours after sponge removal. The prominent symptom of exhibiting estrus in goats treated with different estrus synchronization protocols were the tendency to cluster round the buck at the time of estrus detection, attracted towards male and keeping alliance with males kept in the adjacent pens. Higher incidence of wagging of tail was recorded in goats in estrus. Increased restlessness, frequent urination were other signs of estrus seen in majority of goats during the study. Intermittent bleating was observed in few goats during estrus. The intensity of swelling of vulva in goats was found to be less prominent. The bucks when confronted with synchronized goats, presented sexual arousal, exhibited flehmen reaction and then erection of the penis. The goats during estrus were receptive to mounting, and stood to be mounted. On perusal of literature these estrus symptoms were comparable with the findings of Bhattacharya *et al.* (2000) in Assam local goats and Goel and Agrawal (2002) in Jakhrana goats of Indian origin. Among all the treatment groups in the present study, estrual discharge was observed in only one Osmanabadi goat belonging to treatment Group II (progestagen-impregnated intra vaginal sponge + eCG administered on the day of sponge removal). Three Sangamneri goats in Group II exhibited continuous estrus behavior until fifth to sixth day after sponge removal. One Sangamneri goat in Group IV (Progestagen-impregnated intra-vaginal sponges + GnRH 24 hr before sponge removal) exhibited estrus for seven days after sponge removal.

Exhibition of estrus for prolonged period may be due to prolonged duration of ovulation when eCG is administered at the end of progestogen treatment. Administration of eCG lengthen the estrus duration in goats.

3.2. Estrus response

The overall percentage of goats exhibiting estrus following different synchronization protocols were 89.28 % (range 57.14 to 100 %) and 83.33 % (range 66.67 to 100 %) in Sangamneri and Osmanabadi goats, respectively. Estrus response was 100 % in Sangamneri and Osmanabadi goats subjected to estrus synchronization with Progestagen-impregnated intra-vaginal sponges + eCG on day of sponge removal (Treatment Group II), Progestagen-impregnated intra-vaginal sponges + $PGF_2\alpha$ + eCG (Treatment Group III) and Progestagen-impregnated intra-vaginal sponges + GnRH 24 hr before sponge removal (Treatment Group IV). These three types of estrus synchronization protocols used in these trials were equally efficient and resulted in synchrony of estrus in goats of both the breeds. The overall estrus response in all treatment groups was recorded to be non-significant ($P > 0.05$) between these two breeds.

Ogunbiyi *et al.* (1980) reported similar results of estrous synchronization at first and second injections of prostaglandins (64 % and 84 %). Patil *et al.* (2004) reported only 50 % results of estrus response in Osmanabadi goats. Whereas higher percentage of estrus responses were observed by Medan *et al.,* 2003 (100%), Bitaraf *et al.,* 2007 (97 %), whitely and Jackson, 2011 (87.5 to 100 %) in goats using double injection protocol of PGF_2 α for synchronization of estrus.

Similar results reported by Ozyurtlu *et al.* (2011) (in ewe) and Whitley and Jackson (2011) in goats. Riesenberg *et al.*, 2001 (91.7 %), Motlomelo *et al.*, 2002 (97 %) and Bitaraf *et al.*, 2007 (97 %) reported marginally lower percentages of estrus response in goats when progestagen-impregnated intra - vaginal +. eCG protocol was employed. The mean percentage of goats exhibiting estrus when treated with progestagen + PGF_2α + eCG in the present study corroborate with the findings of earlier workers (Freitas *et al.,* 1996[a]; Leboeuf *et al.,* 2003; Karaca *et al.*, 2010; and Nogueira *et al.,* 2011) and was higher when compared with the findings of Drion *et al.,* 2001 (87 %), Fonseca *et al.*, 2005 (86.8%), Fonseca *et al., (*2008) (88.1%) in goats. Around 80 % estrus behavior was observed in Damascus Baladi goats in studies of Telab and Ashmawy (2007) when GnRH was administered 24 h before sponge removal. Teleb and Ashmawy, (2007) recorded 70 % estrus response in Damascus Baladi goats when progestagen impregnated + GnRH was administered on the day of sponge removal protocol of estrus synchronization was employed.

3.3. Onset of estrus

The overall mean interval to onset of estrus in Sangamneri and Osmanabadi goats were 37.20 ± 2.31 h and 37.08 ± 5.72 h, respectively. In Sangamneri goats, duration of onset of estrus from sponge removal was significantly more ($P< 0.05$) in Groups II, IV and V (41.33 to 46.55 h) than in Groups I and III (25.20 to 27.33 h). In Osmanabadi goats, duration of onset of estrus from sponge removal was significantly more ($P< 0.05$) in Groups Groups I, IV and V (44.00 to 48.00 h) than in Groups II and III (24.00 to 26.75 h). There was significant variation ($P< 0.05$) in the duration of onset of estrus between Sangamneri and Osmanabadi goats in Group II (46.51 vs 24.00 h). Whereas durations of onset of estrus were non-significant ($P > 0.05$) between two breeds in Groups I, III, IV and V.

Patil *et al.* (2004) reported the time required for onset of estrus as 35.20±11.74 h in Osmanabadi goats. Longer interval from end of PGF_2α administration to exhibition of estrus were recorded by Medan *et al.,* 2003 (55.7 ± 3 h) in Shiba goats, Whitley and Jackson, 2011 (60.5 h) in goats. Whereas, Bitaraf *et al.* (2007) recorded 26.0±0.4 h (24-31 h) duration of onset of estrus in synchronized Nadooshani goats treated with double injections of prostaglandins. They observed significant difference for the interval between the end of synchronization protocol and the standing heat amongst treatments. The earlier researchers who reported mean duration of onset of estrus include Motlomelo *et al.* (2002) 30.1 ± 5.5 h, Blaszczyk *et al.* (2004) ranged between 32.9±2.4 and 37.4±3.2 h, Bitaraf *et al.* (2007) 26.2±0.5 h (24-34 h) in estrus synchronized goats. Ozyurtlu *et al.* (2011) reported onset of estrus in synchronized ewes ranged from 41.5±1.81 to 53.0±3.37 h. Riesenberg *et al.* (2001) and Patil *et al.* (2004) recorded very high interval of exhibition of estrus in eCG treated goats ranging from 72 h to 5±7 days in nanny goats and 48 - 120 h in Osmanabadi goats, respectively.

Similar observations when treatment of progestagen + PGF_2α + eCG was employed in goats regarding the time for the interval from sponge removal to onset of estrus in goats have been reported by Freitas *et al.* (1996[a]), Drion *et al.* (2001), Leboeuf *et al.* (2003), Fonseca *et al.* (2008), Karaca *et al.* (2010). Higher range of interval of onset of estrus from the time of sponge withdrawal in goats has been reported by Feritas *et al.* (1996[b]), 32 ± 7.1 h; Kusina *et al.* (*1*999), 11 to 96 h; Lymberopoulos *et al.* (2002), 42 to 44 h; Dogan *et al.* (2005), 12 - 66 h; and Fonseca *et al.* (2005), 49.7±15.7 h in synchronized goats. Compared to the present findings decreased interval of exhibition of estrus was reported by Dogan *et al.* (2004), 15.0 - 15.8 h and Nogueira *et al.* (2011), 13.3 - 13.8 h. Teleb and Ashmawy (2007) reported lower interval of initiation of estrus (30.5 ± 0.9 h) in one group of

Damascus Baladi goats following sponge removal than the interval of onset of estrus in the present study using the protocol of progestagen + GnRH administered 24 h before progesterone removal. Whereas, lower durations of onset of estrus after sponge withdrawal compared to the present findings were observed in earlier studies by Pierson *et al.,* 2003 (25.8±1.22 to 39.3±3.76 h), Teleb and Ashmawy, 2007 (30.5 ± 0.9 h, second group), Karaca *et al.,* 2010 (33.1±2.0 h) when goats were synchronized using the protocol of progestagen + GnRH administered on day of sponge removal.

3.4. Estrus Duration

The overall mean duration of estrus in Sangamneri and Osmanabadi goats were 61.08 ± 3.51 h and 62.34 ± 5.38 h, respectively. There was variation in estrus interval among different treatment groups of both the breeds. Longer estrus durations were recorded in goats treated with progestagen-impregnated intra-vaginal sponges + inj. eCG on the day of sponge removal (Group II) in both Sangamneri and Osmanabdi goats when compared to other synchronization protocols. In Sangamneri goats, duration of estrus was significantly more ($P < 0.05$) in Groups II and V (69.27 to 76.36 h) than Groups I, III and IV (44.00 to 56.36 h). In Osmanabadi goats also estrus durations were significantly different ($P < 0.05$) among the treatment groups (Group II and Groups I, III, IV, V). Between Sangamneri and Osmanabadi breeds, duration of estrus was significantly higher ($P < 0.05$) in Group II (76.36 vs 113.14). Whereas, no significant differences ($P >0.05$) were recorded between two breeds of goats in treatment Groups I, III, IV and V. No significant difference ($P > 0.05$) in duration of estrus was noticed between Sangamneri and Osmanabadi breeds.

Average duration of estrus reported by Patil *et al.* (2004) was 24 to 38 hr in Osmanabadi goats. Akusu *et al.* (1986) reported duration of estrus ranging from 10 to 48 h in West African dwarf goats. The values of estrus duration in both breeds in the present study are much higher than reported by Bitaraf *et al.* (2007) who mentioned overall values for duration of estrus as 22-0±0.3 h (17-25 h) in Nadooshini goats when double injection regimen of $PGF_2\alpha$ was employed for synchronization of estrus. Osmanabadi goats showed significantly longer durations ($P < 0.05$) than Sangamneri goats when exposed to progestagen + eCG treatment. Patil *et al.*, 2004 reported estrus duration of 35 h In Osmanabadi goats. In the present study, longer durations of induced estrus periods in both breeds of goats were observed than the results presented by Motlomelo *et al.*, 2002 (33.3 ± 13.4 h), and Blaszczyk *et al.*, 2004 (27.7±4.2 - 32.0±3.4.I h) when goats were treated with progestagen sponges and eCG. Duration of estrus observed by Ozyurtlu *et al.* (2011) in ewes was in the range of 31.9±1.4 to 33.1±1.6 h. However, the longer durations of estrus interval in the present study in Sangamneri and Osmanabadi goats were recorded when compared with the findings of earlier researchers who treated goats with progestagen + $PGF_2\alpha$ + eCG (Freitas *et al.* 1997 (32 ± 7.1 h), Dogan *et al.,* 2004 (30.5 – 34.0 h), Dogan *et al.,* 2005 (29.7 ± 1.3 h), Fonseca *et al.,* 2005 (28.7 ± 11.5 h), Fonseca *et al.,* 2008 (25 h), and Nogueira *et al.*, 2011 (29.6 - 33.6 h). In the present study, difference in estrus interval was not significant ($P > 0.05$) between Sangamneri and Osmanabadi breeds when progestagen + GnRH administered 24 h before sponge removal protocol for estrus synchronization was employed. Teleb and Ashmawy (2007) reported lower interval of durations of estrus for Damascus Baladi does in goats as 24.6±3.7 h. There was no significant ($P > 0.05$) effect of synchronization methods on estrus duration between these two breeds when goats were synchronized with progestagen + GnRH administered on the day of sponge removal. Relatively lower estrus duration (23.0±3.7 h) was observed by Teleb and Ashmawy (2007) in Damascus Baladi goats than the estrus durations observed in the present study.

3.5. Conception rate

All goats were checked for pregnancy with the aid of a trans-abdominal ultrasonic scanning apparatus with a 3.5-5.0 MHz convex probe on 81st and 88th day in Osmanabadi and Sangamneri goats, respectively after mating. The overall pregnancy rate in Sangamneri goats was 68.00 %, whereas for

Osmanabadi goats were 57.14 %. Non-significant difference was observed ($P > 0.05$) in overall conception rates between Sangamneri and Osmanabadi breeds of goats.

Whitley and Jackson (2011) reported higher pregnancy rate (75%) in goats when double $PGF_2\alpha$ injection protocol was employed. Patil *et al.* (2004) reported higher pregnancy rate (66.67 %) in Osmanabadi goats. Motlomelo *et al.* (2002) observed 60 % (MAP + eCG group) and 47% (FGA + eCG group) pregnancy rates in Boer and indigenous goats with no significant difference between groups. Whitley and Jackson (2011) recorded 65.8% conception rate in indigenous Damascus does when exposed to progestagen + eCG treatment for estrus synchronization. Dogan *et al.* (2004) recorded 52.63 % and 50.0 % pregnancy rates in Saanen does for MAP+ $PGF_{2\alpha}$ + eCG and FGA+ $PGF_{2\alpha}$ + eCG protocols, respectively which were lower than conception rate in Sanagmneri and higher than conception in Osmanabadi goats observed in the present study. When progestagen + $PGF_{2\alpha}$ + eCG protocol was compared, Dogan *et al.* (2005) reported 70.0 % pregnancy rate in Anatolian black does. Fonseca *et al.* (2008) observed 77.8 %, 44.4 % and 60.0 % pregnancy rates in lactating, non-lactating and nulliparous Alpine goats, respectively. Whereas, Karaca *et al.* (2010) recorded pregnancy rate of 70.8 % in Hair goats. Conception rate of 80 % was achieved by Teleb and Ashmawy (2007) after using treatment with single intra-muscular injection of 4 µg GnRH 24 h before progestagen sponge removal in Damascus Baladi goats. The results of pregnancy rates in the present study were higher when compared to the results obtained by Karaca et *al.* (2010) who reported 58.3 % conception rate in Hair goats when short term progestagen + GnRH treatment protocol was employed.

3.6. Kidding rate

Overall kidding rates in Sangamneri and Osmanabadi breeds were 63.64 and 71.43 %., respectively. The kidding rate was numerically higher in Osmanabadi goats than Sangamneri goats. There was non-significant difference ($P > 0{\cdot}05$) in overall kidding rates between Sangamneri and Osmanabadi breeds of goats. The kidding rates in goats in the present study corroborates with previous observations of the kidding rates reported by Freitas *et al.* (1996[a]), Kusina *et al.* (1999), Lymberopoulos *et al.* (2002), Leboeuf *et al.* (2003), Bitaraf *et al.* (2007), Karaca *et al.* (2010) and Whitley and Jackson (2011). The kidding rate recorded in the present study was lower than those recorded by Nogueira *et al. (*2011) (82.2%).

3.7. Multiple kidding rates

Multiple kidding rates observed in Sangamneri and Osmanabadi breeds was 47.62 % and 20.00 %., respectively. The multiple kidding rate was significantly higher ($P < 0.05$) in Sangamneri breed than Osmanabadi breed of goats. Relatively higher percentage of multiple kidding rate was reported by Karaca *et al.*, 2010 (69.2 %) in Hair breed of goats.

3.8. Litter size

Overall litter size in Sangamneri and Osmanabadi breeds was found to be 1.52 and 1.20, respectively. Overall litter size was significantly higher ($P < 0{\cdot}05$) in Sangamneri goats than Osmanabadi goats. These results agree with earlier reports of Bitaraf *et al.* (2007). Whereas, values of litter size in Sangamneri and Osmanabadi goat breeds in the present study were lower than those recorded by Adeoye, 1986 (1.6 ± 0.5, West African dwarf goats), Drion et al., 2001 (1.6 to 1.8, Alpine goats), Lymberopoulos *et al*., 2002 (1.63-2.005, Swiss breeds), Karaca et al., 2010 (1.8, Hair goats) and Nogueira *et al.*, 2011 (1.9, Saanen and Alpine goats). This variation may be due to breed differences of goats.

The Sangamneri goats in Group VI (n=6) were inseminated at 48 and 60 h with fresh diluted Sangamneri buck semen. After fixed time artificial insemination, the overall conception rate, kidding

rate, multiple kidding rate and litter size in Sangamneri goats were found to be 66.67 %, 50.0 %, 50.0 % and 1.50, respectively.

4. Conclusion

Estrus response was 100 % for three treatment protocols in Sangamneri and Osmanabadi goats subjected to estrus synchronization using progestagen-impregnated intra-vaginal sponges + eCG on day of sponge removal; progestagen-impregnated intra-vaginal sponges + $PGF_2\alpha$ + eCG; and progestagen-impregnated intra-vaginal sponges + GnRH 24 h before sponge removal. These three types of estrous synchronization protocols used in these trials were equally efficient and resulted in synchrony of estrus in goats of both breeds. Longer interval to onset of estrus was observed in both breeds of goats when exposed with the treatment of progestagen-impregnated intra-vaginal sponges + GnRH 24 h before sponge removal and progestagen-impregnated intra-vaginal sponge + GnRH on the day of sponge removal. Longer estrus durations were recorded in goats treated with progestagen-impregnated intra-vaginal sponges + inj. eCG on the day of sponge removal in both Sangamneri and Osmanabadi breeds of goats compared with other treatment groups. Administration of progestagen (intra-vaginal sponges) together with eCG lengthened estrous duration in goats. The higher conception rate was recorded in Sangamneri goats (88.89 %) when exposed to synchronization treatment of progestagen-impregnated intra-vaginal sponge + GnRH administered 24 h prior to sponge removal, followed by conception (72.73 %) in goats provided with progestagen-impregnated intra-vaginal sponge + eCG administered on the day of sponge removal and (72.73 %) progestagen-impregnated intra-vaginal sponge + GnRH administered on the day of sponge removal. In Osmanabadi goats, among all treatment groups, highest conception (100 %) was recorded in goats treated with synchronization treatment of progestagen+ GnRH administered on the day of sponge removal, followed by conception (71.43 %) in goats provided with progestagen + GnRH administered 24 h prior to sponge removal. The combination of GnRH with short-term progestagen treatment (intra-vaginal sponges) had a positive effect on the fertility parameters viz conception rate in both breeds of goats.

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