Short Communication
The Journal of Animal & Plant Sciences, 25(1): 2015, Page: 298-300
ISSN: 1018-7081

EFFICACY OF SHORT-TERM ESTRUS SYNCHRONIZATION PROTOCOLS AND TIMED ARTIFICIAL INSEMINATION IN SUBTROPICAL GOATS

S. M. H. Andrabi*, M. Anwar and A. Mehmood

Animal Reproduction Program, Animal Sciences Institute, National Agricultural Research Centre, Islamabad, Pakistan
*Corresponding Author E mail: andrabi123@yahoo.com

ABSTRACT

The present study was performed to assess the efficacy of two short-term estrus synchronization protocols at farm vs. field conditions in subtropical goats (n=39) during peak breeding season. Group one was treated with double IM injection of 75 µg cloprostenol (prostaglandin F_2 alpha analogue) at 9 days interval. In group two, estrus was synchronized with injection of 25 mg progesterone (IM), and an injection of cloprostenol at 9 days interval. Timed artificial insemination (TAI) was conducted after 48 h of last cloprostenol injection, followed by 2^{nd} TAI after 12 h with chilled semen. Pregnancy test was performed with ultrasonography at 45 days post-insemination. Estrus was induced in all the animals (100%), irrespective of treatment (double cloprostenol vs. progesterone + cloprostenol) or location (farm vs. field). Treatment and location did not affect estrus onset, estrus duration, pregnancy rate, kidding rate and litter size (p>0.05). However, a trend was evident from the overall values that there was a narrower range in double cloprostenol than progesterone + cloprostenol treated groups in estrus onset (24-37 h vs.18-48 h) and estrus duration (36-60 h vs. 24-96 h). Similarly overall pregnancy rate (78.9% vs. 55%) and kidding rate (68.4% vs. 45%) were higher in double cloprostenol treated does as compared to the progesterone + cloprostenol treated group. In conclusion, the two short-term estrus synchronization protocols evaluated in the present study can be used in subtropical goats during the peak breeding season.

Key words*:* Estrus synchronization, TAI, goats, subtropical.

INTRODUCTION

Estrus synchronization can play a major role in the improvement of breeding efficiency in goat throughout the year. The primary functions of synchronization protocols is to either synchronize estrus so that goat can be inseminated within 24-72 h time period or to synchronize ovulation so goat can be inseminated at a predetermined time known as a timed artificial insemination (TAI). Synchronization protocols comprise combinations of several pharmaceuticals including gonadotropin releasing hormone (GnRH), progestogens, and prostaglandin (reviewed by Fatet *et al.*, 2011).

Different synchronization methods such as short-term and long duration protocols have been used in cycling does, as well as in seasonally anestrous does in order to induce or synchronize estrus (Amoah *et al.,* 1996) with variable fertility rates (40–80%). Lopez-Sebastian *et al.* (2007) successfully assessed the effectiveness of a short duration protocol (IMA.PRO2®) to induce synchronization and TAI in goats. These data suggest that progesterone may act to eliminate corpus luteum (CL) with an abnormal life-span. Preparations of prostaglandin F_2 alpha (PGF2α) have also been successfully used to induce luteolysis for estrus synchronization and TAI in sheep and goats (Abecia *et al.,* 2012). This approach works well during breeding season due to the presence of functional CL responding to the luteolytic effect of the PGF2α (Wildeus, 1999). Therefore, the present study was designed to investigate estrus synchronization and TAI in subtropical goats during peak breeding season. Two short-term protocols at farm vs. field conditions were compared to study their efficacy in terms of estrus synchronization and fertility.

MATERIALS AND METHODS

Location and animals: Experiment was conducted during the peak breeding season (October to December) at two locations *viz-a-viz* under farm conditions at National Agricultural Research Centre, Islamabad, Pakistan (33.42^{O} N) and under field conditions at village Sokhosang, Gujarkhan, Pakistan (33.16^{O} N). At farm, experimental Beetal does (n = 14) along with an aproned male were housed in a well facilitated shed provided with grazing area. Under field conditions, non-descript does were maintained by individual farmers in units of 2-3. The selected animals (n = 25) were assembled at a single location for estrus synchronization and TAI. These animals were housed in a room with thatched roof and earthen floor and were grazed in the peripheral shamlat without a male within 1 km radius. Animals were randomly divided into two treatment groups at each location, irrespective of estrous cycle. The does at both locations were multiparous aged between 2-5 years and were dewormed with Closantel 350 mg + Mebendazole

525 mg bolus (Clomeb, Prix Pharmaceutica, Pakistan) seven days prior to the start of experiment.

Estrus synchronization: In treatment group one, estrus synchronization was carried out with double IM injection of 75 µg cloprostenol (1 ml Dalmazin, Fatro, Italy; $PGF_2\alpha$ analogue) at 9 days interval. In group two, estrus was synchronized with injection of 25 mg progesterone (IM, short-acting, 1 ml Pregtone, Selmore, Pakistan), and an injection of cloprostenol at 9 days interval. A trained person was assigned to observe the first/last overt estrus signs (immobility reflex and tail flagging) in the animals by rubbing the doe's back to observe her reaction (excitatory response). Estrus sign was noted to estimate estrus onset (interval in h between last cloprostenol injection and first overt estrus sign) and estrus duration (interval in h from first to last overt estrus sign).

Timed artificial insemination and pregnancy test: Semen was extended with skimmed milk and filled in 0.5ml straws as described earlier by Mehmood *et al.* (2011). Semen straws were kept in a reagent bottle (held in flask with ice; 4°C) for transportation. Timed artificial insemination (TAI) was performed after 48 h of last cloprostenol injection, followed by 2^{nd} TAI after 12 h with a goat specific AI-gun (IMV, France). Loaded AI-gun covered with plastic sheath (Continental, USA) was inserted into the vagina for semen deposition. Pregnancy test was performed with ultrasonography (SSD 500 with 3.5 MHz probe, Aloka, Japan) at 45 days post-insemination to record pregnancy rate (No. of does pregnant/ No. of does inseminated x 100). At kidding, data on kidding rate (No. of kidding does/No. of does inseminated x 100) and litter size (No. of kids/No. of kidding does) were recorded.

Statistical analyses: Results are presented as means ± SD. Data on estrus synchronization (estrus onset and estrus duration) and fertility (conception rate and kidding rate) were analyzed with ANOVA (General Linear Model) and Chi-square analysis respectively (MINITAB® Release 12.22, 1998).

RESULTS AND DISCUSSION

The incidence of estrus in does was 100%, irrespective of treatment (double cloprostenol vs. progesterone + cloprostenol) or location (farm vs. field). Treatment and location did not affect estrus onset as wells as estrus duration ($p>0.05$) as shown in Table 1. Similarly Gonzalez-Bulnes *et al.* (2006) induced ovulation and estrus in 100% of the treated goats (IM injection of progesterone + buck induction) as compared to the control group (20%; buck induction). However, Mehmood *et al.* (2011) reported occurrence of estrus in 94.5% does during low breeding season by progesterone impregnated vaginal sponges (11 days) followed by eCG and cloprostenol injection under field conditions like that of the present study. Estrus induction in 100% does could be due to the peak breeding season (cyclic animals) as some of the animals (30%) in the treatment groups showed natural heat during the acclimatization period of seven days.

A trend was evident from the overall values that there was a wider range for estrus onset (18-48 h vs. 24-37 h) and duration (24-96 h vs. 36-60 h) in progesterone + cloprostenol than double cloprostenol treated groups. Normally, the duration of estrus is about 36 h but varies from 24-96 h depending on age, breed, season, the presence of a male and estrus induction protocols (Battaglia, 2001; Fatet *et al.*, 2011). In present study, a wider range in estrus duration in goats synchronized with progestagens might be due to the deviation in follicular development and steroid function, when compared with luteolysis in goats synchronized with prostaglandins (Fernandez-Moro *et al.*, 2008).

Pregnancy rate, kidding rate and litter size was not affected by treatment or location ($p>0.05$) as shown in Table 2. Although there was no statistical difference, but pregnancy rate and kidding rate was comparatively higher in double cloprostenol treated does as compared to the progesterone + cloprostenol treated group. It has been suggested that an average fertility rate calculated from <100 observations might be ≥12 percentage units above or below the true value (Amann, 2005). Overall pregnancy rate in the present study is comparable with that of Fitz-Rodriguez *et al.* (2009), who reported an average pregnancy rate of 70% in does managed under natural grazing conditions. The overall kidding rate in our study is similar with that of Leboeuf *et al.* (2008), who considered an average kidding rate of 65% to be acceptable in the field. It is reported in the literature that prolificacy varies among goat breeds (Amoah *et al.*, 1996). In present study, Beetal goats were used on farm and non-descript goats under field conditions, and there was a trend of higher litter size in the field does (1.29 vs. 1.0), indicating the "breed differences".

In conclusion, the two short-term estrus synchronization protocols evaluated in the present study can be used in subtropical goats during the peak breeding season. Whether the double injection treatment with cloprostenol is more effective in terms of fertility as compared to progestagens in TAI protocols during the peak breeding season, needs to be confirmed by further experiments in large number of goats.

Table 1. Effect of short-term synchronization protocols on estrus onset and duration in subtropical goats.

Treatment	Estrus onset (h)			Estrus duration (h)		
	Farm	Field	Overall	Farm	Field	Overall
Double cloprostenol	31.6±4.70* (24-36)** n = 7	29.5±3.70 (24-37) n = 12	29.6±4.60 (24-37) n = 19	48.6±7.09 (36-60) n = 7	49.8±3.50 (42-55) n = 12	49.2±5.30 (36-60) n = 19
Progesterone+ cloprostenol	30.6±10.1 (18-48) n = 7	30.4±4.20 (25-38) n = 13	30.2±8.10 (18-48) n = 20	53.1±27.6 (24-96) n = 7	53.4±14.5 (27-80) n = 13	53.2±21.0 (24-96) n = 20

*Values are mean ± SD. **Range.

The differences in estrus onset and estrus duration between various groups are non-significant (p>0.05).

Table 2. Effect of short-term estrus synchronization protocols on pregnancy rate, kidding rate and litter size in subtropical goats.

Treatment	Pregnancy rate (%)			Kidding rate (%)			Litter size		
	Farm	Field	Overall	Farm	Field	Overall	Farm	Field	Overall
Double cloprostenol	71.4 (5/7)*	83.3 (10/12)	78.9 (15/19)	71.4 (5/7)	66.7** (8/12)	68.4 (13/19)	1.0 (5/5)	1.25 (10/8)	1.15 (15/13)
Progesterone+ cloprostenol	42.9 (3/7)	61.5 (8/13)	55.0 (11/20)	42.9 (3/7)	46.2** (6/13)	45.0 (9/20)	1.0 (3/3)	1.33 (8/6)	1.22 (11/9)

* No./Total.; ** 2 does aborted.

The differences in pregnancy rate, kidding rate and litter size between various groups are non-significant (p>0.05).

Acknowledgements: This study was supported by a grant of RADP subproject (AS-5), Pakistan Agricultural Research Council, Islamabad.

REFERENCES

Abecia J.A., F. Forcada, and A. Gonzalez-Bulnes (2012). Hormonal control of reproduction in small ruminants. Anim. Reprod. Sci. 130: 173-179.

Amann R.P. (2005). Weaknesses in reports of "fertility" for horses and other species. Theriogenology 63: 698-715.

Amoah E.A., S. Gelay, P. Guthrie, and C.E. Rexroad Jr (1996). Breeding season and aspects of reproduction of female goats. J. Anim. Sci. 74: 723-728.

Battaglia R.A. (2001). Handbook of Livestock Management, Prentice-Hall Inc., New Jersey, USA.

Fatet A., M.T. Pellicer-Rubio, and B. Leboeuf (2011). Reproductive cycle of goats. Anim. Reprod. Sci. 124: 211-219.

Fernandez-Moro D., A. Veiga-Lopez, C. Ariznavarreta, J.A.F. Tresguerres, T. Encinas, and A. Gonzalez-Bulnes (2008). Preovulatory follicle development in goats following oestrous synchronization with progestagens or prostaglandins. Reprod. Dom. Anim. 43: 9-14.

Fitz-Rodriguez G., M.A. De Santiago-Miramontes, R.J. Scaramuzzi, B. Malpaux, and J.A. Delgadillo (2009). Nutritional supplementation improves ovulation and pregnancy rates in female goats managed under natural grazing conditions and exposed to the male effect. Anim. Reprod. Sci. 116: 85-94.

Gonzalez-Bulnes A., J.A. Carrizosa, B. Urrutia, and A. Lopez-Sebastian (2006). Oestrous behavior and development of preovulatory follicles in goats induced to ovulate using the male effect with and without progesterone priming. Reprod. Fertil. Dev. 18: 745-750.

Leboeuf B., J.A. Delgadillo, E. Manfredi, A. Piacère, V. Clément, P. Martin, M .Pellicer, P. Boué, and R. deCremoux (2008). Management of goat reproduction and insemination for genetic improvement in France. Reprod. Dom. Anim. 43: 1-7.

Lopez-Sebastian A, A, Gonzalez-Bulnes, J.A. Carrizosa, B. Urrutia, C. Diaz-Delfa, J. Santiago-Moreno, and A Gomez-Brunet (2007). Review: New estrus synchronization and artificial insemination protocol for goats based on male exposure, progesterone and cloprostenol during the non-breeding season. Theriogenology 68: 1081-1087.

Mehmood A., S.M.H. Andrabi, M. Anwar, and M. Rafiq (2011). Estrus synchronization and artificial insemination in goats during breeding season-a preliminary study. Pakistan Vet. J. 31: 157-159.

Wildeus S. (1999). Current concepts in synchronization of estrus: Sheep and goats. Proc. American Soc. Anim. Sci., 77: 1-14.