

INFLUENCE OF BREED ON PROSTAGLANDIN BASED OESTRUS SYNCHRONISATION IN NIGERIAN GOATS

DUNG, C.E.^{1*}, KAWU, M.U.², MAKUN, H.J.³, HABIBU, B.² and YAQUB, L.S.²

^{1*} Department of Veterinary Physiology, University of Jos.

²Department of Veterinary Physiology, Ahmadu Bello University, Zaria.

³National Animal Production Research Institute, Shika, Ahmadu Bello University, Zaria.

*Corresponding author: edward.dung@yahoo.com; +2347063399888

ABSTRACT

The aim of the study was to evaluate the influence of breed differences on oestrus responses and progesterone profiles following synchronisation with prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) in Red Sokoto (RS), Sahelian (SH) and West African Dwarf goats (WAD). Thirty (N = 30) apparently healthy, RS (n = 10), SH (n = 10) and WAD (10) goats, within the age range of 1.5 – 2.0 years, and body condition score of 2.0 – 3.0 were used for the study. Each doe was synchronised with 1 mL (0.26 mg) cloprostenol sodium (Synchromate[®]) by deep i.m. injection. The does were bred by natural breeding using two fertile bucks of each breed. Five millilitre of blood sample was collected from each doe on day 0 (pre-synchronisation sample), days 1, 2 and 3 post-synchronisation for determination of progesterone (P₄). The findings of the study were as follows: Oestrus response rate: RS, 100 %; SH, 100%; WAD, 0%; pregnancy rate: RS, 70%; SH, 20%; WAD, 0%. Serum P₄ (ng/mL) was higher in SH that kidded than RS that kidded (SHK: 2.07 ± 0.22 vs RSK: 1.38 ± 0.07 ; $P < 0.05$). It is therefore concluded that, RS goats responded better to $PGF_{2\alpha}$ synchronisation than SH and WAD. The WAD goats were non-responsive to synchronisation with $PGF_{2\alpha}$. While the SHK had significantly higher serum P₄ than RSK. It is recommended that double treatment with $PGF_{2\alpha}$ or pre-treatment with progesterone, or GnRH (ovsynch) should be considered when using $PGF_{2\alpha}$ based oestrus synchronization protocol in SH and WAD goats.

Key words: Breed, Prostaglandin, Oestrus synchronisation, Progesterone profile

INTRODUCTION

There is an increasing demand for meat from goat production and one way to meet this growing demand for animal protein on a sustainable basis in Nigeria is to develop an intensive goat production industry involving oestrus synchronisation, twice yearly kidding and feedlot fattening of kids (Kawu, 2000). Oestrus synchronisation is a valuable management tool that has been successfully employed to enhance reproductive efficiency in ruminants (EL- Makadem *et al.*, 2019). In small ruminants, oestrus synchronisation is achieved either by reducing the length of the luteal phase of oestrus cycle with prostaglandin $F_{2\alpha}$ (Kawu, 2000) or by extending the cycle artificially with exogenous progesterone (Omontese *et al.*, 2010). Synchronisation of oestrus in a group of females allows one to predict the time of oestrus with reasonable accuracy. The most widespread method of oestrus synchronisation used in goats involves progesterone treatment for 9–11 days followed by a luteolytic dose of prostaglandin administered in the period of 48 h prior to sponge removal (Baldassarre and Karatzas, 2004). Nutrition, season, dose and potency of the agent has been reported to affect synchronization outcome (Baldassarre and Karatzas, 2004). This study was designed to evaluate oestrus response and serum progesterone profile in RS, SH and WAD goats following $PGF_{2\alpha}$ induced synchronisation.

MATERIALS AND METHODS

The study was carried out at the Small Ruminant Research Program (SRRP) of the National Animal Production Research Institute, (NAPRI), Shika. Thirty apparently healthy, non-pregnant and cycling RS (n=10), SH (n=10), and WAD does (n=10) were selected from a standing flock were used for the study. The does were fed *Digitaria smuttsi* hay as basal diet and supplemented with 15% crude protein concentrate ration at 3% of body weight per day. Water was provided *ad libitum*. Each doe was synchronised with 1 mL of a synthetic $PGF_{2\alpha}$ cloprostenol sodium (Synchromate[®], 0.26 mg) by a single deep i.m. injection. At the beginning of the experiment, the does were housed in 6 separate pens of 5 animals each for each breed. Each group of five does had a matured proven buck for breeding purpose.

The buck was used for heat detection and subsequent breeding and left with the group for seven days post-synchronisation. Pregnancy was confirmed by ultrasonography and pregnancy and kidding rates were calculated. Serum P_4 concentration was determined by ELISA method (Accubind ELISA Microwell; MonobindInc[®], USA)

Data analysis

Oestrus response, pregnancy and kidding rates were expressed as percentages. While serum P_4 concentration was expressed as mean ($\pm$ SEM) and analysed using one-way ANOVA. GraphPad prism version 5.0 was used for the analysis.

RESULTS AND DISCUSSION

The oestrous response rates achieved with $PGF_{2\alpha}$ synchronization in RS and SH in the present study is higher than the 90% estrus response recorded in Nadooshani goats (Bitaraf *et al.*, 2007). Although lower values of 64% and 84% following single and double injection, respectively, with $PGF_{2\alpha}$ has been reported in Brown goats in the same environment (Ogunbiyi *et al.*, 1980). The difference observed in oestrus response between the present study and previous report may be due to breed, nutritional status, prevailing meteorological parameters, dose and potency of the agent used, stage of oestrous cycle or stage of maturity of the *corpus luteum*. The pregnancy rates recorded for both RS and SH were lower compared to the values reported in Brown goats following double injections of $PGF_{2\alpha}$ (Ogunbiyi *et al.*, 1980). This is because double $PGF_{2\alpha}$ given 11 days apart allows for sufficiently high levels of circulating progesterone (P_4) to ensure viability of the pregnancy. However, the higher pregnancy rate in the RS compared to SH in this study suggests better physiological adaptation of RS goats compared to SH and WAD goats to the Northern Guinea Savannah zone where the study was conducted. The pre-synchronization P_4 concentration in the RS and SH of ≥ 1 ng/mL suggests that these breeds were in luteal phase of oestrous cycle prior to $PGF_{2\alpha}$ treatment. Except for WAD goats that had P_4 profile < 0.5 ng/mL throughout the study period and failed to exhibit sexual receptivity. Therefore, the 100% oestrus response rates obtained in both RS and SH may be due to fact that these does were in luteal phase with functional corpus luteum which responded to the $PGF_{2\alpha}$ treatment. The P_4 values recorded in this study are within the range reported during the luteal phase in Damascus goat (Khanum *et al.*, 2008). Bauerufeid and Holtz (1991) recorded critical P_4 level of between 0.5 – 1.0 ng/ml to determine the absence or presence of functional *corpus luteum*. Therefore, the P_4 profile in WAD goats that was below 0.5 ng/mL on Day 0 and thereafter may be due to inactivity of the ovaries or absence of functional *corpus luteum* at time of $PGF_{2\alpha}$ administration. The slight decline in P_4 level on Day1 in RSK and SHK may signify failing CL that led to a decline in P_4 , thus heralding a new follicular phase. Furthermore, the increase in P_4 in RSK and SHK on Day2 and maintenance of these values through Day 3 point to the fact that they most likely ovulated on day 2. This is in consonance with findings in laparatomised Jamunapari goats observed at hourly intervals following the onset of sexual receptivity and by gross ovarian changes (Goel and Kharche, 2012). It is worthy of note that irrespective of sampling day and physiological status of the does, the SHK does had a significantly higher P_4 profile relative to RSK goats. This may be due to breed difference as observed by Fonseca and Torres, (2005). Although, it has been reported that ovulation rate significantly correlated with P_4 profile during the early oestrous cycle phase (day 0-6), but this becomes non-significant as the cycle progresses (Arashiro *et al.*, 2010). This may not be the case in this study as the RS goats had a better pregnancy rate, which may imply a better ovulation rate or more conducive uterine environment. The SHK goats may have had a better luteal tissue size during luteogenesis compared to RS goats. A positive correlation between luteal tissue area and concentration of P_4 has been reported in various animal species (Orita *et al.*, 2000). The decline in P_4 post-induction of oestrus in SHN and its maintenance on subsequent days similar to the WAD values, may indicate that those does never ovulated. This is further buttressed by their P_4 level that was below 0.5-1.0ng/ml post-induction of oestrus.

Table 1: Oestrus response, pregnancy and kidding rates and, litter size following prostaglandin $F_{2\alpha}$ induced synchronisation in Red Sokoto, Sahelian and West African Dwarf goats

Parameter	Red Sokoto goats	Sahelian goats	West African Dwarf goats
Oestrus response (%)	100.0	100.0	0.0
Pregnancy rate (%)	70.0	20.0	0.0
Kidding rate (%)	90.0	20.0	0.0
Litter size	0.9	0.5	0.0

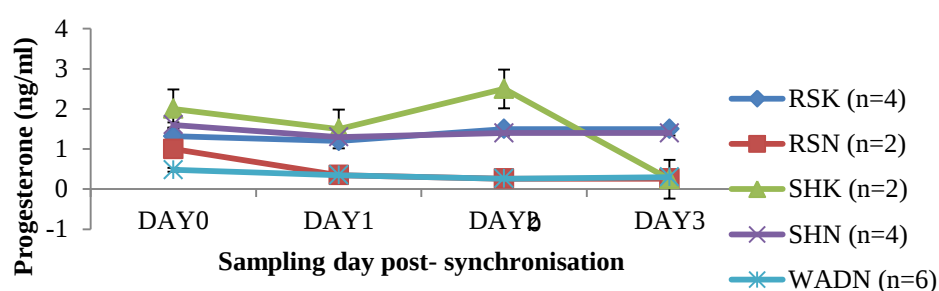


Figure1: Serum progesterone profile between Day 0 and Day 3 in Red Sokoto, Sahelian and West African Dwarf goats. RSK: Red Sokoto that kidded; RSN: Red Sokoto that did not kid; SHK: Sahel that kidded; SHN: Sahel that did not kid and WADN: West African Dwarf goats.

CONCLUSION AND RECOMMENDATION

It is concluded that RS and SH goats responded better to oestrus synchronization with prostaglandin $F_{2\alpha}$ than WAD. While pregnancy and kidding rates following $PGF_{2\alpha}$ synchronization were better in the RS than in SH. It is recommended that double treatment with $PGF_{2\alpha}$ or pre-treatment with progesterone, or GnRH (ovysynch) should be considered when using $PGF_{2\alpha}$ based oestrus synchronization protocol in SH and WAD goats.

REFERENCES

- Baldassarre, H. and Karatzas, C.N. (2004). Advanced assisted reproductive technologies (ART) in goats. *Animal Reproduction Science*, 82:255–266.
- Bauernfeind, W. and Holtz, A. (1991). Progesterone and estrogen levels in serum of cycling goats measured by enzyme immunoassay. *Small Ruminant Research*, 6: 95-102.
- EL- Makadem, M.Y., NourEldin, A.N.M., Ramadan, T.A., Rashad, A.M.A, Taha, T.A. and Samak, M.A. (2019). Alleviation of reproductive seasonality in Barki ewes using CIDR- eCG with or without melatonin. *Small Ruminant Research*, 174: 170 – 178.
- Fonseca, J.F. and Torres, C.A.A. (2005). Administration of hCG 5 days after breeding and reproductive performance in multiparous dairy goats. *Reproduction in Domestic Animals*, 40: 495-499.
- Kawu, M.U. (2000). Post-partum uterine and ovarian changes and the effects of oestrus synchronization on rebreeding in the savannah Brown goats. Msc. thesis submitted to the Post Graduate School, Ahmadu Bello University, Zaria. Pp: 25-34.
- Ogunbiyi, P.O., Molokwu, E.C., and Sooriyamoorthy, T. (1980). Estrus synchronization and controlled breeding in goats using prostaglandin $F_{2\alpha}$. *Theriogenology*, 4: 257-261.
- Orita, J., Tanaka, T. and Kamomae, H. (2000). Ultrasonographic observation of follicular and luteal dynamics during estrous cycle in Shiba goats. *Journal of Reproduction and Development*, 31-37.
- Omotesi, B.O., Rekwot, P.I., Makun, H.J., Obidi, J.A., Rwuaan, J.S. and Chiezey, N.P. (2010). Evaluation of EAZIBREEDTM CIDR® and FGA-30® intravaginal sponges as synchronizing agents in Prepartum Sahel Does. *Journal of Veterinary Research*, 3: 64- 69.
- Goel, A.K.; Agrawal, K.P. (1998). Oestrus synchronization in cyclic goats following luteal administration. *Journal of Animal Science*, 68 :155-156.