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Original article

Prostaglandin versus progestagen protocols in oestrus synchronization in the Yankasa ewe

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ABSTRACT

This study was conducted to compare the effects of prostaglandins (estroPLAN® and Lutalyse®) and progestagens (CIDR® and FGA-45®) in synchronizing oestrus in Yankasa ewes between January and February 2014. Thirty three (33) Yankasa ewes aged 1.5-3 years, 21 to 26 kg body weights, with body condition score of 2.5-3.5 were used in this study. Ewes were randomly allocated into 5 groups, Group 1 (ewes treated with Lutalyse® [YK-LT], n= 7), Group 2 (ewes treated with estroPLAN® [YK-ET], n= 7), Group 3 (ewes treated with EAZI- BREED™ CIDR® [YK-CD], n= 5), Group 4 (ewes treated with Fluorogestone acetate-45® [YK-FG], n= 7) and Group 5 (Control [YK-CT], n= 7). Natural breeding was carried out using sexually active rams for 5 days following progestagen withdrawal and second prostaglandin administration. 100% oestrus response was observed in YK-ET, YK-CD and YK-FG, respectively. Time to onset of oestrus was 68.23 ± 17.28 h in YK-LT, 49.29 ± 4.5 h in YK-ET, 33.48 ± 8.6 in YK-CD, 53.27 ± 12.3 in YK-FG and 39.2 ± 13 in YK-CT. Duration of oestrus was longest in YK-LT (51.35 ± 13.9 h) and shortest in YK-CT (17.2 ± 6.9 h). Mounts per oestrus period was highest in YK-CT (26.9 ± 4.8) and lowest in YK-ET (14.3 ± 4.3). Conception rate was 100% in the YK-LT, YK-ET, YK-CD groups respectively. It is concluded that estroPLAN® and CIDR® offered the best results in synchronizing oestrus in

Yankasa ewes and may be used by farmers to enhance productivity.

1. Introduction

Oestrous synchronization is a process aimed at bringing animals to oestrus (heat) at a desired time by use of exogenous hormones to manipulate the life span of the corpus luteum (CL) and (or) to synchronize follicle development (Siriwat, 2011). Treatment with an oestrous synchronization protocol can also increase the number of females pregnant early in the breeding season, which results in a shorter lambing season and a more uniform lamb crop at weaning (Siriwat, 2011). Oestrus synchronisation is a valuable management tool that has been successfully employed to enhance reproductive efficiency in ruminants (Kusina et al., 2000). Yankasa sheep is the most numerous breed of sheep in Nigeria and also has the widest distribution, being found throughout the sub-humid and semi-arid zones (FDLPCS, 1991). It is estimated to constitute about 60% of the sheep population in Nigeria (Osinowo, 1992).

Yankasa sheep constitute the largest sheep population in the northern part of Nigeria (Blench, 1999). Efforts to improve their reproductive efficiency through oestrus synchronisation will help improve the herd size as well as value for farmers. The application of Assisted Reproductive Technologies (ARTs) such as oestrus synchronisation will help improve reproductive performance in Yankasa sheep. Intravaginal pessaries impregnated with either synthetic or naturally-occurring progesterone have been studied (Fukui et al., 1987; Jafar et al., 2010). The use of prostaglandin F2α or its analogs causes luteolysis in sheep having a functional corpus luteum (Gordon, 1999; Salverson et al., 2002; Fred & Doug, 2012). The aim of this study is to compare the effectiveness of natural and synthetic prostaglandins (estroPLAN® cloprostenol sodium and lutalyse® dinoprost tromethamine) and progestagens (EAZI-Breed™ CIDR® (controlled internal drug release) and FGA-45® (Fluorogestone acetate) treatment protocols in synchronizing oestrus in Yankasa breed of sheep.

2. Materials and methods

2.1. Study area

This study was carried out during the period between January and February 2014 (dry season), at the Animal Reproduction Research Programme (ARRP), National Animal Production Research Institute (NAPRI), Shika, Ahmadu Bello University, Zaria, Kaduna state Nigeria. NAPRI is Located in the Northern Guinea Savannah zone of Nigeria between 11˚N and 12˚N and between 7˚E and 33˚E, 650 m above sea level and an average annual maximum and minimum temperatures of 31.0 ± 3.2˚C and 18.0 ± 3.7˚C , respectively. Mean daily temperatures range from 15 - 36˚C and mean relative humidity of between 20- 37% (Akpa et al., 2002).

2.2. Experimental animals, herd management and housing

Thirty three (n= 33) Yankasa ewes aged between 1.5 to 3 years, 21 to 26 kg body weight, with body condition scores of 2.5 to 3.5 (Spahr, 2005), that have shown at least two natural oestrous cycles based on records (19- 21 days) were used in this study. Individual ewes were identified by means of plastic ear tags. Digitaria smutsii (wooly finger grass) hay; concentrate (cotton seed cake, groundnut cake, palm kennel cake and soya bean cake at 0.5 kg day-1) and water were given to ewes according to the standard protocol of Animal Reproduction Research Program (ARRP) of NAPRI.

2.3. Oestrus synchronization

Ewes were randomly allocated into five groups as follows;

Group 1 [YK-LT] (Natural prostaglandins): A total of 7 Yankasa ewes were treated with two intramuscular administration of 10 mg Lutalyse® (Pharmacia & Upjohn) 12 days apart.

Group 2 [YK-ET] (Synthetic prostaglandin): A total of 7 Yankasa ewes (treated with two intramuscular administration of 125 µg estroPLAN® (Parnell Australia Pty Ltd) 12 days apart.

Group 3 [YK-CD] (Natural progestagen): A total of 5 Yankasa ewes were treated with EAZI- BREED™ CIDR® (Pharmacia & Upjohn Pty Limited, Rydalmere NSW) alone for 12 days.

Group 4 [YK-FG] (Synthetic progestagen): A total of 7 Yankasa ewes were treated with FGA-45® Vaginal Sponge (Chronopgest, Intervet, Netherlands) alone for 12 days.

Group 5 [YK-CT] (Control): A total of 7 Yankasa ewes without any treatment for 12 days.

2.4. Oestrus detection and mating

Following removal of progestagens and second administration of prostaglandins, the treated ewes were observed for behavioural oestrus manifestation twice daily (0700-1000 and 1500-1800 hours) for 5days. Ewes were exposed to one proven sexually active ram per group to aid oestrus detection (Abecia et al., 2012). Ewes were considered to be in oestrus when they "stand to be mounted" by males. Other signs such as vigorous tail-wagging, reddened and swollen vulva, clear mucus discharge, restlessness, tail wagging, frequent bleating and frequent adoption of urination posture were noted (Zakari, 1981). Rams were allowed to run with the other ewes in the group. Oestrus activity occurring within 120 hours post withdrawal of progestagen and second administration of prostaglandins were classified as synchronized. The following oestrus parameters as indicated below were evaluated; Oestrus response (%): The number of ewes showing standing oestrus and subsequently mated, over the total number of ewes in each treatment group, expressed in percentage.

Time to onset oestrus: This is measured by recording the time (hours) interval of ewes to first expression of standing oestrus (heat) after treatments and exposure to rams expressed as Mean (± SEM). Duration of oestrus: This is measured by the time (hours) between the first and last standing oestrus expressed as Mean (± SEM).

Mount per oestrus period: This is measured by recording the total number of successful mounts during the synchronized oestrus period (120 hours) expressed as Mean (± SEM).

Conception rate (%): This is number of ewes that failed to return to oestrus 17-21 days after breeding over the total number of ewes bred expressed as the percentage.

2.5. Data and statistical analysis

Variables such as oestrus response and conception rate were expressed in percentages. GraphPad Prism 5 data package was employed for statistical analyses. Time to onset of oestrus, duration of oestrus and mount per oestrus period were expressed as Mean ± SEM and ANOVA (Tukey's test) was used to compare means within treatment groups. Values of $P< 0.05$ were considered significant.

3. Results and discussion

The 100% oestrus response observed in Yankasa ewes treated with CIDR (YK-CD) and FGA-45 (YK-FG) is consistent with the findings of (Musa-Azarai et al., 2011) who obtained similar result, thus, indicating that both natural and synthetic progestagens were equally efficient in inducing synchronized oestrus. Higher oestrus response rate was observed in the YK-ET (100%) than in the YK-LT group (85.7%) indicting the superiority of synthetic prostaglandin in synchronizing oestrus in Yankasa ewes. This is similar to report of (Öztürkler, 2003) who observed 100% oestrus response rate using estrumate 11 days apart in Tushin ewes.

The average time to onset of oestrus in this present study ranged between 33 hours and 68 hours. This is similar to that reported by other researchers (Ungerfeld & Rubianes, 2002; Zeleke, 2005; Turk, 2008; Martemucci & D'Alessandro, 2010; Özyurtlu et la., 2010). Natural progestagen hastened time to onset of oestrus than synthetic progestagen (33.48 ± 8.58 versus 53.27 ± 12.33). Time to onset of oestrus of 33 hours was reported by (Godfrey et al., 1997) following CIDR treatment in Tropical haired sheep ewes. This is similar to that observed in Yankasa ewes treated with CIDR in this study. More so, time to onset of oestrus was longer in the YK-LT than in the YK-ET group suggesting that synthetic prostaglandin hastened time to onset of oestrus in Yankasa ewes, similar to that reported by other researchers in ewes (Recai et al., 2013).

In this study, duration of oestrus was shorter in the YK-FG than in the YK-CD group. This corroborates the report of (Omontese et al., 2010) in Yankasa ewes who observed shorter oestrus duration with FGA than the CIDR. Comparable values (25 hours) in duration of induced oestrus have been reported in Yankasa ewes (Oyedipe et al., 1989; Musa-Azarai et al., 2011). Differences in duration of oestrus as observed in this study in comparison to reports by other researchers may be due to type of hormone treatment, protocols and breed of sheep (Oyedipe et al., 1989; Omontese et al., 2010).

Mount per oestrus period was highest in the control group (YK-CT). However, the mount per oestrus period observed in Yankasa ewes treated with FGA-45 mg is higher than the 9.8 ± 2.5 reported by (Oyedipe et al., 1989) in Yankasa ewes treated with FGA-30 mg. This difference may be due to a higher dose of Fluorogestone acetate (FGA-45 mg) used in this study.

At 48 hours following withdrawal of intravaginal progestagens and after second prostaglandin administration, highest oestrus synchrony was observed in ewes treated with CIDR and estroPLAN. This is consistent with the 100% reported by (Jafar et al., 2011; Godfrey et al., 1997) in Tropical haired sheep treated with CIDR and Merino ewes treated with estrumate after 48 hours respectively.

Conception rate was higher in the YK-CD group (100%) than in the YK-FG group (86%). Similar reports in ewes following treatment with CIDR and FGA have been reported (Godfrey et al., 1997; Olivera-Muzante et la., 2011). Also, conception rate was 100% in both the YK-LT and YK-ET group. This is higher than the 86% reported by (Godfrey et al., 1997) in Tropical haired sheep and the 51% reported by (Greyling & Van der Westhuysen 1979) in Corriedale ewes.

Oestrus response rate, time to onset of oestrus, duration of oestrus, mount per oestrus, oestrus synchrony and conception rate are summarized in table 1 below.

Table 1
Summary of oestrus synchronization in Yankasa ewes.

Parameter	**Group 1 Lutalys®**	**Group2 estroPLA®**	**Group3 CIDR®**	**Group4 FGA-45®**	**Group 5 Control**
No of ewes	7	7	5	7	7
Oestrus response rate (%)	85.7 (6/7)	100 (7/7)	100 (5/5)	100 (7/7)	71 (5/7)
Time to onset of oestrus(Mean±SEM)	68.23 ± 17.3	49.29 ± 4.5	33.48 ± 8.6	53.27 ± 12.3	39.2 ± 13
Duration of oestrus mean (± sem)	51.35 ± 13.9	31.19 ± 7.9	35.25 ± 8.3	25.30 ± 6.3	17.2 ± 6.9
Mounts per oestrus period mean (± sem)	24.6 ± 5.9	14.3 ± 4.3	23.2 ± 6.8	14.7 ± 4.6	26.9 ± 4.8
Oestrus synchrony (%)	57	100	100	86	29
Conception rate (%)	100	100	100	86	43

The difference in mean values for the onset of oestrus, duration of oestrus and mounts per oestrus period across the treatment groups were not significant (P=.05).

4. Conclusion

Both protocols were efficient in oestrus synchronization. However, estroPLAN® and CIDR® offered the best results in synchronizing oestrus in Yankasa ewes. This study also confirmed that a 12-day treatment protocol using two doses of prostaglandin (estroPLAN® and Lutalyse®) and progestagen (CIDR® and FGA-45®) can be used in synchronizing oestrus in Yankasa ewes.

Conflict of interest

The author(s) declare(s) that there is no conflict of interests regarding the publication of this paper.

Authors contributions

Danjuma, Friday Audu designed the study, wrote the protocol, managed the literature search and wrote the first draft of the manuscript. Bawa Elias Kambai, Nwannenna Agnes Ifeyinwa and Aluwong Tagang managed the analysis of the study and performed the statistical analysis. All authors read and approved the final manuscript.

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