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Evaluation of EAZI-Breed™ CIDR® and FGA-30® Intravaginal Sponge as Estrus Synchronizing Agents in Pre-Partum Red Sokoto Does

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Abstract: The efficiency of EAZI-Breed™ CIDR® and FGA-30® intravaginal sponges in synchronizing estrus was investigated in prepartum Red Sokoto does. About 19 randomly cycling pre-partum Red Sokoto does aged between 1.5-2 years and weighing between 12-14 kg were used for this study. They were randomly assigned into two groups, Group A (FGA, n = 10) and Group B (CIDR®, n = 9) for 21 days. Natural mating was performed following progestagen withdrawal for animals detected to be on heat. Estrus response was 20 and 55.6% in groups A and B, respectively. The time to estrus onset following progestagen withdrawal for FGA and CIDR (Mean±S.D.) was 93.09±2.06 and 50.29±4.71 h; duration of induced estrus (0.08±0.05 and 39.99±6.05 h) while estrus cessation was (93.14±2.03 and 90.48±4.69 h) in group A and B, respectively. Interval between withdrawal of progestagen and onset of estrus was significantly ($p<0.05$) longer in FGA compared to CIDR. The duration of induced estrus period was significantly ($p<0.05$) longer in CIDR treatment. Retention rate was 100% (FGA) and 88.9% (CIDR) in group A and B, respectively. Drawstring breakage was observed in FGA sponges but absent in CIDR devices. Also, vaginal discharge rate was higher in FGA than CIDR groups. These results show that CIDR devices are more efficient in synchronizing estrus in prepartum Red Sokoto does. This is because CIDR provides higher estrus response rate, shorter time to estrus, longer duration of estrus, absence of drawstring breakage and better ease of application. Therefore, the use of CIDR is advocated.

Key words: CIDR, FGA-30, estrus response, goats, sponges, drawsting

INTRODUCTION

Small ruminants have been reported to form an integral part of the cultural life and system of Nigeria's peasantry (Ajala, 2004). There is a pressing need to increase the production of domestic animals such as the small ruminants which are conventional sources of animal protein. This is to overcome the acute shortage of animal protein in the diet of the average Nigerian (Shaib *et al*., 1997). The potential importance of goat meat in meeting the protein requirement of Nigerians was recognized by the FAO report on Nigeria (Anonymoun, 1968). One way to meet this demand for animal protein on a sustainable basis is to develop an intensive goat production industry involving estrus synchronization, twice yearly kidding and feedlot fattening of kids in Nigeria (Kawu, 2000). Red Sokoto goats constitute 60% of the Nigerian goat population of about 34.5 million and are predominantly found in the arid and semi-arid regions of the Northern Guinea Savannah zone (Molokwu and Igono, 1982; Wilson, 1991; RIM, 1992). They are year round breeders with age and weight at first estrus ranging from 120-157 days and 10-18 kg, respectively (Wilson, 1991). The value of estrus synchronization is vital in does as the duration of both estrous cycle and estrus is variable and estrus detection cannot be accomplished safely without a buck (Jainudeen *et al*., 2000). A number of estrus synchronization trials in goat include the use of prostaglandins (Ogunbiyi *et al*., 1980), progesterone impregnated sponges (Simplicio and Machado, 1991) and prostaglandins in conjunction with progesterone-based synchronization protocols (Kusina *et al*., 2000; Medan *et al*., 2002). Until now, Controlled Intravaginal Drug Releasing device (CIDR) and subcutaneous implants are more preferable than sponges (Rahman *et al*., 2008).

The reproductive performance of goats indigenous to the tropics in general is low particularly due to insufficient data available, poor nutrition andmanagement. There is abundant literature on the influence of season on the reproduction of domestic animals (Rekwot *et al*., 1987). Some of the factors responsible for this low reproductive

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efficiency include irregular estrus cycles, poor signs of estrus and low fertility rates (Voh, 1984). Red Sokoto goats are the most widespread breeds of goats in northern Nigeria. There is a paucity of information regarding estrus synchronization efficiency and fertility in these breeds induced by hormonal treatment. The aim of this study therefore was to determine the effectiveness of EAZI-Breed™ CIDR® and FGA-30® vaginal sponge in synchronizing estrus in prepartum Red Sokoto does.

MATERIALS AND METHODS

Location: The study was carried out at the Small Ruminant Research Programme of National Animal Production Research Institute (NAPRI), Shika-Zaria, Northern Nigeria, latitude 11°12'N and longitude 7°37'E between June and August, 2009. An average annual maximum and minimum temperature of 31.8±3.2°C and 18.0±3.7°C, respectively characterize the climate of the area. The monthly average rainfall during the rainy season (May-October) is 148.1±68.4 mm (69.2-231.9 mm).

Experimental does and herd management: About 19 randomly cycling pre-partum Red Sokoto does (doelings) aged between 1.5-2 years and weighing between 12-14 kg were used for this study. During the experiment they were confined in two separate pens (per treatment group) and maintained intensively on *Digitaria smutsii* (wooly finger grass) hay; concentrate supplement (0.5 kg day^{-1}) was given and water was provided *ad libitum*. The animals were individually identified by means of plastic ear tags. Before the experiment, all the animals were not pregnant since proper record of their estrous cycle activities were kept.

Synchronization of estrus: The animals were randomly distributed into two treatment groups as follows; Group A-consisting of ten Red Sokoto does with FGA-30® Vaginal Sponge. These are polyurethane sponges impregnated with 30 mg Flurogesterone acetate which is a potent progestin that prolongs the diestrus stage of the reproductive cycle allowing synchronization of the breeding cycle. Group B-consisting of nine Red Sokoto does treated with EAZI-Breed™ CIDR® an inert silicone elastomer impregnated with 0.3 g progesterone which acts by prolonging the luteal phase of the estrous cycle thereby synchronizing estrus.

Insertion and removal of devices: In Group A, FGA-30® vaginal sponge was inserted into the vagina of each doe with the aid of an applicator. The applicator was disinfected with chlorhexidine, lubricated using glycerol and with a gloved hand inserted into the vagina. The applicator plunger was pushed gently to eject the sponge ensuring that the drawstring was still hanging outside the vagina. In Group B, EAZI-Breed™ CIDR® device was inserted into the vagina of each doe with the aid of the device applicator. After loading the applicator, the tip was lubricated with glycerol and then inserted through the vulva into the vagina. The applicator plunger was pressed to release the device, leaving the cord protruding from the vulva. The devices (FGA vaginal sponge and EAZI-Breed™ CIDR®) were allowed in place for 21 days after which they were removed by pulling the removal cord/draw-string.

Estrus detection: Following removal of the devices, the does were observed visually for behavioral estrus manifestation two times (0800-1100; 1500-1800) daily for 5 days. Standing to be mounted by other females (homosexual mounting) and mounting by the males (heterosexual mounting) was taken to be the primary and sole criteria to judge evidence of estrus. An ratio of one buck to ten does (Abiodun, 1998) was made to ensure adequate detection of heat by the rams. Does observed to be on standing heat were noted and naturally mated.

Estrus behaviour and efficacy of progestagens: The following estrus behavior and device/sponge properties were measured.

Estrus response (%): The number of does that show standing estrus and subsequently mated to the total number of does in each treatment group expressed in percentage.

Time to onset of estrus: This was measured by recording the time (h) interval from when the devices/sponge were removed to the time when the doe first expressed standing estrus (heat) after being exposed to the buck expressed as mean±Standard Error of Mean (SEM).

Duration of estrus: The duration in h expressed as the mean±Standard Error of Mean (SEM) between the first standing estrus and the last time of allowing mounting by the buck.

Time to cessation of estrus: This was measured by recording the time (h) interval from when the devices/sponge were removed to the time when the doe finally expressed standing estrus (heat) after being exposed to the buck expressed as mean-Standard Error of Mean (SEM).

Retention rate (%): This was measured by the number of does that retained the intravaginal sponges or device to the total number in each treatment group for the period of the experiment without voiding it expressed in percentage.

Vaginal discharge rate (%): This was measured by the number of does that showed vaginal discharges on removal of the device or sponge to the total number in each treatment group that retained the device/sponge expressed in percentage.

Draw-string breakage rate (%): This was measured by the number of the devices or sponge that firmly adhered to the vaginal mucosa resulting in fracture of the draw-string during removal necessitating the use of external aid to remove device/sponge to the number in each treatment group that retained the device/sponge expressed in percentage.

Statistical analysis: The following variables (estrus response, device/sponge retention, vaginal discharge, draw-string breakage) were expressed in percentages. Data on time to onset of estrus, duration of estrus and cessation of estrus were also analyzed using the Independent t-test using SPSS-11 data package. The 95% significance level was noted. The SPSS-11.0 software was used for all statistical analyses.

RESULTS AND DISCUSSION

The time to onset of estrus, time to cessation of estrus duration of estrus, estrus response, retention rates, vaginal discharge rate and draw-string breakage rates after progestagen removal are shown in Table 1. Time to onset of estrus, duration of estrus, estrus response, retention, vaginal discharge, drawstring breakage rates were 93.09±2.06 h, 0.08±0.05 h, 100, 100 and 40, 50.29±4.71, 39.99±6.05, 55.6, 88.9, 77.8 and 0% in groups A and B, respectively.

There was significant difference ($p<0.05$) in terms of estrus response rate, time to estrus onset and duration of induced estrus recorded between FGA and CIDR (20%, 93.09±2.06 h, 0.08±0.05 h versus 55.6%, 50.29±4.71 h, 39.99±6.05 h). Time to estrus onset was shorter in the group that received CIDR (23.57±4.07 h) than FGA (43.60±6.98 h). Group A had a higher retention rate than group B (100% versus 88.9%) while draw-string breakage was absent in group B. Vaginal discharge rate was higher in group A than B (100 versus 77.8%). The progestagens (CIDR and FGA) used in this study were efficient in synchronizing estrus in Red Sokoto does. Similar findings using CIDR and sponges were observed by Knight and Hall (1988) although, marked variation in the estrus responses was observed in this study. Even though not much study has been done using FGA-30® and EAZI-Breed™ CIDR® in goats particularly in Nigeria, the results obtained was lower than the 100% reported by Dogan *et al.* (2004) using medroxyprogesterone and FGA sponges in Saanen does.

Table 1: Summary of estrus synchronization in does

Treatment group	A (FGA)	B (CIDR)
No. of does (n)	10	9
Estrus onset (h) Mean+SEM	93.09±2.06	50.29±4.71
Estrus cessation (h) Mean+SEM	93.14±2.03	90.48± 4.69
Estrus duration (h) Mean+SEM	0.08±0.05	39.99±6.05
Response rate (%)	20	55.6
Retention rate (%)	100	88.9
Vaginal discharge Rate (%)	100	77.8
Draw-string breakage Rate (%)	40	0

h = Hours, n = Number, SEM = Standard error of mean

The variation in estrus response rates in this study which was 20 and 55.6% for in groups A and B, respectively may be due to silent estrus, low level ovarian activity (Whaeton *et al.*, 1993), effect of season and weather conditions (Freitas *et al.*, 1997) and iatrogenic causes. Overall estrus response from both treatments was 37.8% and occurred 50-93 h after intravaginal devices withdrawal. On the contrary, Knight and Hall (1988) cited estrus response following CIDR removal to be significantly lower than that obtained following sponge treatment (87 versus 94%). This was however, related to higher loss of CIDRs compared to sponges (63 versus 0.8%). This is not in agreement with this study where estrus response was higher in Group B (55.6%) than group A (20%) following device withdrawal.

In this study, the mean interval to onset of estrus following progestagen withdrawal was about 72 h and was significantly different between the FGA and CIDR group (Fig. 1).

This was longer than the 15.8±0.9 and 15.0±0.6 h reported by Dogan *et al.* (2004) in Saanen does using FGA and MAP, respectively. Some researchers have reported the onset of estrus to occur within 6-120 h following progestagen removal (Romano, 1998; Greyling and Van der Nest, 2000). These differences may be explained by variation in breed, lactation, nutrition, season, use of gonadotropins and presence of males after progestagen removal (Muna *et al.*, 1998; Romano, 1998, 2002). Duration of estrus was longer in Group B (39.99±6.05 h) treatment than in group A (0.08±0.05 h).

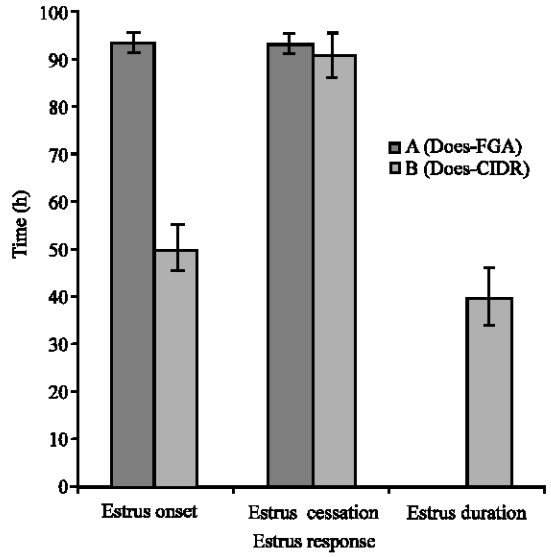

Fig. 1: Summary of estrus synchronization Group A= Does treated with FGA-30® vaginal sponge Group B = Does treated with EAZI-Breed™ CIDR®

Type of progestagen thus had a significant effect on the duration of induced estrus period. The mean duration of estrus obtained in this study is lower than that reported by Greyling and Van der Nest (2000); Motlomelo *et al*., (2002). Dogan *et al*. (2004) reported duration of estrus to be 30.5±1.9 and 34.0±1.4 h for medroxy progesterone and FGA, respectively in Saanen does Retention rate was higher in does treated with FGA-30® vaginal sponge (100%) than EAZI-Breed™ CIDR®. This is contrary to observations by Romano (1996) who observed a 100% retention rate for both CIDR and FGA sponges throughout the period of the experiment.

Other researches have reported a high number of CIDR losses in ewes (Rhodes and Nathaniel, 1988). This contradicts the result in this experiment. Previous experience with the use of CIDR in ewes, techniques employed in inserting the sponge, factors such as intravaginal sponge texture and consistency could influence sponge retention in the vagina (Alifakiotist *et al*., 1982). A disadvantage described by Greyling and Brink (1987) while using CIDRs dispensers, i.e, difficult insertion was not observed in this study.

At the time of progestagen removal, the appearance of vaginal discharge was investigated. Every member of Groups A (Sponge treatment) expelled foul-smelly straw-coloured vaginal discharge (>3 mLs each) on removal of the sponge after the period of treatment; unlike the volume (<1 mL) of discharge obtained in fewer members of Groups B (CIDR treatment) that was less foul smelly. Amir and Ali (2006) reported that majority of ewes that received CIDR (17/19) and sponge (14/14) had vaginal discharge at the time of device removal. The above result is similar to the findings of this experiment where Groups A and B had (10/10) and (8/9) vaginal discharge, respectively. Draw-string breakage was present in Sponge treated Groups A (40%). This was however absent in the CIDR treated Groups B. This made the removal of CIDR easier and less cumbersome. Sponges were found to adhere very tightly to the vaginal mucosa making withdrawal quite difficult.

This predisposed the draw-strings in sponges to breakages when being pulled during removal at the end of the treatment period. On the contrary, removal of CIDR device was easier as such adhesion as seen in sponges to the vaginal mucosa was absent. This confirms reports that implants are preferable to sponges because they are easy to use (Holtz, 2005). In every case where there was drawstring breakage, a tissue forceps was skillfully and carefully employed to remove the retained sponge piece.

CONCLUSION

In this study, the results of present study indicate that the source of progestin affects the estrus response (CIDR versus FGA). FGA sponges produced poor estrus response as compared to CIDR devices. Withdrawal of intravaginal devices resulted in drawstring breakage in FGA sponges making it more cumbersome and difficult to use. Such was absent in CIDR devices. Estrus response was higher, time to onset of estrus was shorter and duration of estrus was longer in the groups treated with CIDR (Group B). Therefore, the use of CIDR in synchronizing estrus in Red Sokoto does is advocated.

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