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Full Length Research Paper

An assessment of the reproductive performance of estrus synchronized West African Dwarf (WAD) does using medroxyl-progestrone acetate (MPA)

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This study was carried out to assess the reproductive performance of cycling West African Dwarf does as well as to assess the efficacy of medroxyl-progestrone acetate, an estrus synchronizing drug, that has the advantage of being administered orally and intramuscularly. The experiment was laid out in a completely randomized design using 40 cycling does divided into five experimental treatment groups. The results of the experiment show that estrus behavior in the does was significantly (P<0.05) influenced by the dosage and route of drug administration. On the other hand, other reproductive traits assessed such as gestation length (days), litter size at birth, birth weight of kids (Kg) and weaning weight (Kg) were not significantly (P>0.05) affected by the drug. These results show that there is good prospect in the use of medroxyl-progestrone acetate orally and intramuscularly in synchronizing estrus in cycling WAD does.

Key words: Reproductive performance, estrus synchronization, medroxyl-progesterone acetate, goat.

INTRODUCTION

The need for increased animal protein production in developing countries like Nigeria cannot be over emphasized. This is because the population of Nigeria is constantly on the increase; with over 140 million population size according to the most recent population census figure (Frederick et al*.,* 2007). Many Nigerians consume less than 10 g of animal protein daily, against the minimum of 28 g/caput/day for a balanced diet (Ibe, 2004), because of the high cost. Furthermore, our livestock industries have not been fully developed to meet the ever increasing demand for animal protein. To achieve success succeed in increasing available animal protein in Nigeria, deliberate effort must be made to improve the management system, the environment, plane of nutrition, selection of breeding animals and disease control. Also in selecting the breeding stock, animals with high reproductive efficiency should be chosen because reproductive inefficiency has been recognized as the most costly and limiting constraint to animal production (Campbell et al., 2003; Imasuen and Otoikhian, 2006).

Improvement in reproductive efficiency will increase the economic viability of the livestock enterprise. The reproductive efficiency depends on the duration of pregnancy, litter size, normal embryo/foetal development, survival, viability, growth of new borns during breastfeeding and at pubertal age, as well as the duration of the reproductive life of the animal (Al-Merestani et al., 2003).

To achieve the above factors, the use of modern reproductive tools such as estrus synchronization, super ovulation amongst others, will result in more kids. The synchronization technique offers the opportunity to increase the efficiency of animal production because it reduces the time needed for the detection of oestrus, permits mating/artificial insemination at a predetermined schedule, shortens the duration of kidding interval in the flock, and reduces mortality at birth by avoiding breeding during extreme climatic seasons. Consequently it permits weaning, fattening and marketing of uniform groups of animals.

The aim of this study, therefore, was to examine the use of medroxyl progesterone acetate (MPA), which is one of the cheapest progesterone drugs that has the ad-

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Table 1. Estrous behaviour in wad does administered varying levels of mpa drugs.

Estrous behaviour	Treatments				
	1 (25 mg Depo)	2 (50 mg Depo)	3 (5 mg Provera)	4 (10 mg Provera)	5 (Control)
Oestrus response (%)	77.80 c	85.70 b	66.70 d	88.90 a	55.60 e
Onset of estrus (h)	1,346.00 ± 249.65b	1814.00 ±137.92a	363.500 ± 28.40c	310.00 ± 11.9c	390.00 ± 52.19c
Duration of oestrus (h)	27.00 ± 4.43a,b	32.00 ± 4.89a,b	20.00 ± 2.30 b	35.00 ± 4.12 a	29.00 ± 3.00ab

[a,b]Values with different letter superscript within the same row are significantly different ($P < 0.05$).

vantage of being administered orally and intramuscularly for synchronization of estrus in West African Dwarf goats which were hittherto left to their natural reproductive cycle. It is our view that with the use of this drug to achieve estrus synchronization in WAD goats, productivity will increase, thereby making more meat available and affordable.

MATERIALS AND METHODS

Description of location and site of experiment

The experiment was carried out at the Teaching and Research Farm, Faculty of Agriculture, Ambrose Alli University, Ekpoma, in Edo State, which lies along latitude 6½ degree North and longitude 6 degree North, located in the rainforest zone of Nigeria with an average annual rainfall of about 1500-2000 mm per annum, relative humidity of about 75% with a mean temperature of 24°C (Frederick et al., 2007).

The natural vegetation around this area is mainly composed of Guinea grass (*Panicum maximum*), Gamba grass (*Adropogon gayanus*), Elephant grass (*Pennisetum purpureum*), Calapo (*Calapogonium muconoides*), Stylo (*Stylosanthes guianensis*), Centro (*Centrosema pubescens*) and Tridax (*Tridax procubens*) amongst others.

Animals and management

40 cycling West African Dwarf (WAD) nanny goats were used for this experiment and were purchased directly from local farmers rather than buying from the open market so as to guarantee the quality of stock used. Only does with four to six broad central teeth were purchased. This was done to ensure that only cycling does of 2-3 years of age with an average weight of 16.59 ± 0.76 kg and which have kidded once or twice were used for the experiment. This was done using the dentition and weight range methods as outlined by Sastry and Thomas (1975) and Devendra and Burns (1983).

Prior to the commencement of the experiment, all does were acclimatized for 30 days during which routine treatment developed by NAPRI (1984) was administered under the supervision of a Veterinarian. At the end of the adaptation period, the animals were randomly assigned to five treatment groups and each treatment group had eight WAD does. The animals were separated into the treatment groups based on the route of administration and dosage of the drug administered. Thus, the five treatment groups consisted of the following:

Treatment 1: Does administered with 25 mg MPA (Depo-provera®) intramuscular injection, single dose.
Treatment 2: Does administered with 50 mg MPA (Depo-provera®) intramuscular injection, single does.
Treatment 3: Does administered with 5 mg MPA (provera®) orally for ten days.
Treatment 4: Does administered with 10 mg MPA (provera ®) orally for ten days.
Treatment 5: Does administered with 5 ml sterile water orally for 10 days. This group served as the control group.

The dosage of medroxyl-progesterone acetate (MPA) used in this experiment was due to the fact that this drug comes in an injectable form (Depo–provera®) and also as orally active tablets (Provera®). The tablet form comes in 5 and 10 mg, therefore it was convenient to administer a single tablet of 5 or 10 mg per day for 10 days. Also the injectable form (Depo–provera®) was half the tablet form (Provera®) because the injectable form is a long acting drug, which is always administered as a single dose.

The animals used for the experiment were identified individually with neck tags coded according to the treatment groups. All the animals were managed semi–intensively. They were fed in the mornings between 8 and 10 a.m. daily with *Arachis hypogea* (groundnut) hay, *Gliricidia sepium*, *Panicum maximum* and occasionally *Zea mays* (maize) or *Manihot esculenta* (cassava) peelings, when available, before allowing them to go out from their pens into the adjoining fenced paddock. The animals were allowed to remain in the paddock to graze freely between 10.00 and 18.00 h before being allowed to return to their pens for confinement. Water and salt lick were provided *ad libitum.*

The two types of medroxyl-progestrone acetate (MPA) were administered to the cycling does with the aim of synchronizing estrus in the goats. Depo-provera was administered through intramuscular injection as a single dose, while provera was administered orally for ten consecutive days before withdrawal.

Two weeks after drug withdrawal, the does were exposed to intact males with aprons to prevent indiscriminate mating. The bucks were allowed to run with the does for two hours in the morning under the strict observance of farm attendants. They were later separated from the does to be re-introduced 8 h later, for another two h. An allowance of one buck to ten does (Abiodun, 1998) was made to ensure adequate detection of heat by the bucks. Does observed to be on standing heat were noted and naturally mated thereafter. Such does were further allowed to run with the other. A further notice of standing heat by the doe was used to estimate the duration of estrus in hours.

Estrus (heat) was detected by exposing all the does in the treatment groups to five intact males with aprons for 2 h 3 times a day at an interval of 8 h. The following estrus behavior was measured (Table 1).

I. 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 = (Number of does in estrus/Total number of does in the treatment group) X 100
II. Duration of Estrus: The duration in hours, between the first standing oestus and the last time of allowing mounting by the buck.
III. Onset of Estrus: This was measured by recording the time (hours) from when the doe was exposed to the buck to the time of expressing standing estrus (heat).

This stage marked the final stage of the experiments whereby the reproductive performance of the does after synchronized estrus was assessed.

Data collection from the day of mating, through gestation period to parturition and weaning of the kids were used for the assessment

Table 2. Evaluation of reproductive performance in WAD does administered varying levels of MPA drugs.

Reproductive performance	Treatments				
	1 (25 mg Depo)	2 (50 mg Depo)	3 (5 mg Provera)	4 (10 mg Provera)	5 (Control)
Conception Rate (%)	71.40[c]	62.50[d]	75.00[b]	77.70[a]	55.50[e]
Gestation Length (days)	150.00 ± 0.70[a]	154.00 ± 1.93[a]	149.25 ± 1.25[a]	150.00 ± 1.78[a]	151.00 ± 2.72[a]
Litter Size at Birth	1.75 ± 0.25[a]	1.75 ± 0.25[a]	2.25 ± 0.25[a]	2.00 ± 0.40[a]	1.75 ± 0.25[a]
Birth Weight of Kids (Kg)	1.225 ± 0.03[a]	1.198 ± 0.60[a]	1.248 ± 0.029[a]	1.233 ± 0.03[a]	1.283 ± 0.02[a]
Weaning Weight (Kg)	3.730 ± 0.08[a]	3.613 ± 0.17[a]	3.570 ± 0.26[a]	3.690 ± 0.10[a]	2.960 ± 0.05[b]

[a,b,c,d]Values with different letter superscript within the same row are significantly different ($P < 0.05$).

of reproductive performance. The following data were used for the assessment of reproductive performance (Table 2).

i. Kidding Rate (%): This was determined by dividing the total number of does kidded in each treatment group by the total number of does actually mated, expressed in percentage. That is:

Kidding Rate = (Does Kidded / Does Mated) X 100

ii. Gestation Length: This is the period, in days, from conception to birth of the young.
iii. Litter Size: This is the number of kids born by a doe at parturition.
iv. Birth Weight: The live body weight of a kid in kilograms taken within 24 h after delivery.
v. Weaning Weight: The live body weight of kids taken on the day of separation from its dam (i.e. 3 months post-kidding).

Statistical analysis

All data collected were subjected to analysis of variance using the SAS/STAT (2004) package. Mean separation was done where there were indications of significant difference using Duncan's Multiple Range Test. Parameters such as estrus response and kidding rate which were measured in percentage, were however not subjected to analysis of variance

RESULTS AND DISCUSION

The oestrous cycle in goats is about 17-21 days and this is very similar to that of cows. Factors that have been identified as affecting the estrous cycle include season, nutrition, body condition, age and management (Ologun, 1986; Mukasa-Mugerwa et al., 1991). The estrous cycle in female mammals is divided into four main phases; estrus (heat) period, metestrus, diestrus and proestrus. Of these four phases, an event happening during the estrus phases is the main focus of estrus synchronization. This is because, it is at this stage that eggs are released (ovulation) from the ovary, and if animals are mated at the right time, fertilization and conception will take place.

In this study, therefore, an attempt was made to examine the degree of estrus response, onset of estrus and duration of estrus after synchronizing estrus in the does with MPA drug.

The results of the study as shown in Table 1 reveal that the degree of response to estrus was significantly higher ($p<0.05$) in treatment 4. This was followed by treatments 2, 1, 3, and 5, respectively. The response level in treatment 4 (88.90%) and treatment 2 (85.70%) were higher than 75% reported by Olugun (2004), when he tested the use of MPA for estrus synchronization in sheep, although virginal sponge, and intramuscular routes of administration were used in the study.

The duration of estrus was also significantly higher in treatment 4. The range of 20.00 to 35.00 hour reported in this work agrees with previous research reports, (Akusu and Egbunike, 1984; Ola and Egbunike, 2005).

The onset of estrus was significantly higher ($p<0.05$) in treatments 1 and 2 and this is why Egbunike and Olu (2003) removed such results from their study when MPA drug was administered intramuscularly in WAD does. They reported that the onset of estrus was delayed until day 77th post injection.

However, treatments 3 and 4 had onset of estrus, which were within the range reported by Ola and Egbunike (2005) when other progestin drugs were used to synchronize estrus in WAD does.

The assessment of the reproductive performance as shown in Table 2 reveals that conception rate was better in the groups administered with oral MPA drug (i.e. treatments 3 and 4) compared to those administered intramuscular injection (i.e. treatments 1 and 2). This trait was significantly higher in treatments 3 and 4. The responses in all the treatments were as good as those of previous works that also used progestagin drug (Holst and Moore, 1971; Ola and Egbunike, 2005).

The gestation length in days, litter sizes at birth, birth weight of kids were not significantly different in all the treatment groups. The weaning weight of kids was significantly lower in the control.

The results of the reproductive traits obtained in this work compared favourably with those of other researchers in WAD goats (Akusu and Ajala, 2000; Ola and Egbunike, 2005, Otoikhian, 2005). However, higher birth weight and weaning weight were reported in other breads such as the white Bornu goats (Otoikhian, 2005) and other exotic breeds.

Conclusion

From the results of this study the following conclusions were drawn. The onset of estrus after synchronizing estrus with MPA was found to be very high when the injectable form of MPA drug was used. However, the degree of estrus response and duration of estrus compared favorably with the oral form of the drug.

The reproductive performance was generally better in does that were given the oral form of MPA drug compared to those that received the injectable form of the drug. The performance was found to be better in the groups that received the higher dose of either the oral or injectable form of the drug.

From the findings of this research work, the authors are of the view that farmers should take advantage of these new techniques of estrus synchronization to improve the efficiency of goat production. The flexibility of using medroxyl-progesterone acetate will give room for farmers to use either the oral form of the drug that is easier to administer or the injectable form of the drug, which require administration by a trained personnel. However, irrespective of the choice to make, farmers are advised to seek the advice of a veterinarian before embarking on an estrus synchronization programme. On the whole, no matter the technique (oral or injection) goat farmers should target the niche market during festive periods like Christmas, Easter and Moslem festivals, when there is higher demand and better price for goat meat

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