



Influence of different feed mixtures on the reproductive parameters of does of West African Dwarf and Sahel goats in Bali, Taraba State, Nigeria

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Abstract

The study evaluated the influence of feed on the reproductive parameter of West African Dwarf (WAD) and Sahel goats. A total of 24 doe goats of the two breeds were used for the experiment as 2x3x4 factorial design. They were fed *Gmelina arborea* leaves and cassava peel meal, Gmelina and cowpea husk, *Ficus sycamores* and cassava peel meal and, Ficus and cowpea husk as experimental treatments, designated T₁, T₂, T₃ and T₄, respectively. The average age at first oestrus, oestrus period, oestrous length, gestation period, age at first kidding and postpartum dam weight for WAD were 41.08 weeks, 37.50 hours, 20.25 days, 144.35 days, 15.92 months, and 7.67 kg, respectively. The corresponding values for Sahel goat were 41.75 weeks, 29.00 hours, 20.17 days, 142.83 days, 15.83 months, and 11.36 kg, respectively. Age at first oestrus, oestrous and gestation lengths, and age at first kidding did not differ significantly among breeds. Oestrus period and postpartum dam weight varied significantly ($P < 0.05$) with breed. Similarly, age at first oestrus, oestrus period and length did not vary with diet, whereas gestation period, age at first kidding and postpartum weight varied significantly ($P < 0.05$) with diets. Diets containing cassava peel meal had longest gestation period and age at first kidding, while those containing cowpea husk had higher postpartum dam weight. It was concluded that for shorter gestation length and age at first kidding, and corresponding increase in postpartum dam weight, the feeding of cowpea husk with browse is recommended over the inclusion of cassava peel meal.

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INTRODUCTION

Goats are considered superior to other ruminant species in their utilization of fibrous feeds (Oyeyemi and Akusu, 2005; Bolaji *et al.*, 2016). They are also more efficiently raised in small holdings due to

their small size, early maturity, and short generation interval. The productivity, chemical composition and nutritive value of grasses found in Nigeria vary according to species, nature and fertility of soil, water availability, season of the year, and stage of

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growth (Jane *et al.*, 2011). In the drier Northern States of Nigeria, the prolonged dry season and high temperatures are accompanied by rapid deterioration in quantity and quality (mostly protein) of grasses (Aregheore, 1995).

Onyeonagu and Njoku (2010) reported that crop residues have been identified as essential livestock feed. They include those from cereals, roots tubers, fruits and legumes (Assan, 2020). Onwuka *et al.* (1997) reported that about 40 % of livestock farmers in Nigeria used cowpea vines and husks and sorghum grain chaffs to feed their animals, especially at sheep and goat selling points and holding units. The authors also stated that the nutritional potentials of residues needed to be emphasized to farmers to encourage further utilization as livestock feed. In addition, Otsyina and Mckell, (1984) indicated that browse plants especially the Sahara vegetation types, contribute large amount of available forage as complementary feed, particularly during the dry season when herbaceous pasture is in short supply. Browse plants are not susceptible to sudden climatic changes and therefore continue to produce rich fodder in terms of quality and quantity even during the dry season.

The study was, therefore, designed to investigate some reproductive parameters of does of two breeds of goats found in the Southern savannah, particularly the WAD and Sahel goats. However, Sahel goats were found in fewer population among the pastoralists that transverse the region for more and better feeds on seasonal (dry) bases namely: age at first oestrus, oestrus period, oestrous interval, gestation length, age at first kidding and postpartum weight in relation to breed and feed intake.

MATERIALS AND METHODS

Experimental site, animal and management

The study was conducted at the Teaching and Research Farm, Federal Polytechnic, Bali, Taraba State, Nigeria. Bali Local Government Area (LGA) is located between the latitude 7°12' and 9°00' N of the equator, longitudes 10°00' and, 12°00'E of the Greenwich Meridian, and at an altitude of 4500 to 5000 metres above sea level (Adebayo and Bashir, 2005).

Thirty-two goats made up of 16 West African Dwarf and 16 Sahel of between 6 and 8 months of age and weighing 8-9 kg, were used for the study. The animals were obtained from small holder subsistence farmers and some pastoralists, who reared them extensively on natural pastures with little or no supplementations and took them to local livestock markets in and around Bali town. The ages of the animals were determined using the dentition estimation method, by counting the number of permanent incisors that have erupted on the lower jaw as described by Sastry and Thomas (1980) and Matika *et al.* (1992).

The animals were managed semi-intensively. In the night, they were kept in a cross ventilated pen of 2x5m² within the animal house made up of concrete blocks, cemented floor and wall, and zinc roofing. Mineral licks were provided periodically. Routine health care: vaccination, medication, deworming and regular acaricidal application were carried out. Clean fresh water was provided *ad libitum*. The animals were acclimatized for two weeks before the commencement of the experiment. The pen (housing) was cleaned on weekly basis, while feeding/ water troughs were usually cleaned before

serving the day's provision on daily basis.

Experimental diets and procedure

Four experimental diets; T1 (Gmelina + Cassava peel meal [GCpM]), T2 (Gmelina + Cowpea husk [GCpH]), T3 (Ficus + cassava peels meal [FCpM]) and T4 (Ficus + cowpea husk [FCpH]) were constituted and fed to the animals. The animals were randomly allotted to the four treatment in a factorial design of 2x4x4 according to breed, and 4 treatments, such that there were three does and a buck per treatment i.e. ratio of 3:1 and replicated four times.

The leaves of browse were fed at 1.5 kg per animal/day by hanging using a rope and allowed it to the floor of the pen. The supplements (1.5 kg) were fed per animal per day. Half of the quantities of browse and supplement were served in the morning (8-10 am) before being released to graze natural pasture under the supervision of an attendant until on return in the evening at 5.00pm when the remaining were fed.

Data collection

After two weeks into the experiment and on experimental diets, the following reproductive parameters were observed: **Age at first oestrus**, which was established by observing some behavioural activities of the doe, such as being chased by other does and/or bucks, frequent wagging of tail and urination, swollen and mucus discharge from the vulva and, sniffing of genitalia by bucks. Oestrus duration being the length of these activities; Oestrus cycle, which was the period from one oestrus to another; Gestation length, which was the period from a successful mount / conception (i.e., no repeat) to kidding; and Age at first kidding, which was determined as the period from birth of the doe to first

kidding/parity.

Statistical analysis

The data obtained were subjected to analysis of variance (ANOVA) procedure as contained in the statistical package of Statistix 8.0 (2009) USA. Significant means were compared using the Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The reproductive parameters of does on different feeds are shown in Table 1. The average overall reproductive parameters were: age at first oestrus (41.42 weeks), oestrus period (33.25hrs), oestrous length (20.21 days), gestation length (43.58 days), age at first kidding (15.88 months), and postpartum dam weight (9.5 kg). Oestrus period and postpartum dam weight varied significantly ($P < 0.05$) with breed, while the remaining parameters did not. The West African Dwarf (WAD) goats had higher oestrus period (37 hrs) and postpartum dam weight (7.67kg) than the corresponding values of 29.00 hrs and 11.36 kg for the Sahel.

The reproductive parameters investigated are partly useful in determining how early the breeds can be bred and how often (frequent). Thus they determine the annual or life time kid crops expected from the breeds. In particular, ages at first oestrus and kidding determine how early a doe is expected to first mate and kid. Oestrus period shows how long at a time, the doe will allow itself to be mated. The others are related, to some extent, how often kidding will or can take place and condition of doe after kidding.

The age of first kidding found in this study as compared to the range of 12 to 18 months for goats in the tropics (Payne and Wilson,

Table 1: Means of reproductive parameters of female goats by breed and diet

Factors?	N	Age at first oestrus (weeks)	Oestrus period (Hours)	Oestrus length (Days)	Gestation period (Days)	Age at first kidding (Months)	Postpartum dam weight (Kg)
Overall	24	41.417	33.250	20.208	143.58	15.875	9.5125
Breed		ns	*	ns	Ns	ns	*
WAD	12	41.083	37.500 ^a	20.250	144.33	15.917	7.667 ^b
Sahel	12	41.750	29.000 ^b	20.167	142.83	15.833	11.358 ^a
Treatment		ns	ns	ns	*	*	*
T1 (GCPM)	6	43.667	32.000	21.000	146.50 ^a	16.667 ^{ab}	7.817 ^c
T2 (GCpH)	6	41.333	36.000	21.667	139.00 ^c	14.833 ^b	10.200 ^b
T3 (FCPM)	6	42.000	31.000	19.667	146.17 ^a	18.333 ^a	8.250 ^c
T4 (FCpH)	6	38.667	34.000	18.500	142.67 ^b	13.667 ^b	11.783 ^a

*=P<0.05, a, b, c = means in a column with different superscripts are not statistically similar, ns=Not Significant, Gm=*Gmelina arborea*, Fs=*Ficus sycamorus*, Cpm= Cassava peel meal, Cph= Cowpea husk, WAD= West African Dwarf. GCPM=Gmelina+cassava peel meal, GCpH= Gmelina+cowpea husk, FCPM=Ficus+cassava peel meal, FCpH=Ficus+cowpea husk.

1999) shows that the goats studied were generally medium kidders (not late or early kidders). On the other hand, oestrous and gestation lengths showed that, the does may be medium in kidding (Dadi *et al.*, 2008).

Most of the values of the reproductive parameters reported in this study were similar to those previously observed (Abi-Saab *et al.*, 1997; Webb and Mamabolo, 2004; Zarkawi and Al-Saker, 2013; Kunbhar *et al.*, 2016). A significant breed difference was observed in oestrus period and postpartum weight only. Salami *et al.* (2009), who work on Comparative behavioural signs and physical manifestation of estrous in Nigeria breeds of goats, also found significant difference in these parameters. In the present study also found significant difference in these parameters. In the present study, however, it could be said that the two breeds were similar in the reproductive parameters considered.

Gestation length, age at first kidding, postpartum dam weight varied significantly (P<0.05) with diet, while the remaining

parameters did not. Gestation lengths were highest for T1, T3, GCPM (146.50 days) and FCPM (146.17 days) and lowest for T4 and T2 FCpH (142.67 days) and GCpH (139.0 days), respectively. Age at first kidding was highest (18.33 months) for FCPM, but lowest (13.67 months) for FCpH. Postpartum weight was higher for FCpH (11.78kg) and GCpH (10.2kg) than the other diets

Since nutrition is crucial in the reproduction process of goats. It is generally expected that goats on high plane of nutrition will reproduce faster and therefore will have better (reproductive) parameter values. However, that age at first oestrus, oestrus period and oestrous interval length did not vary with diet, showed that the use of any of the treatment combinations was equally effective on these reproductive parameters. On the other hand, GCPM and FCPM resulted in higher gestation length and age at first kidding i.e., cassava peel meal fed in combination with the browse irrespective of type increased the value of these

parameters. This is as compared to the inclusion of cowpea husk. Similarly, cowpea husk in combination with any browse increased postpartum weight. Thus, cassava peel meal and cowpea husk in appropriate combinations with these browse can be used, depending on what is needed, to increase or decrease the values of gestation length, age at first kidding and postpartum weight. Kunbhar *et al.* (2016) observed that environmental factors such as feeding, inefficient and insufficient management of the does may influence post-partum oestrus. Nutrition, has effect on postpartum period. Apparently better nutrition and management contribute to early post-partum oestrus.

Correlation between doe's reproductive parameters

Relationships among the reproductive parameters of does were as presented in Table 2. The correlation coefficient between gestation length and age at first kidding was medium and positive (0.344). Those between age at first oestrus and oestrus length (0.0190), gestation period (0.1575) and age at first kidding (0.1931), though positive, were low. The correlation values between postpartum doe weight and gestation length and age at first kidding were -0.5852 and -0.4609, respectively. The remaining values were negative and low. High correlation value between two variables/ members of a pair (shows strong

relationship) are used as time and cost saver. This is because one member of the pair could be measured on the other and the value used to indicate/or approximate the other. The medium correlation between age at first kidding and gestation length indicated some relationship i.e., that increase in one led to increase in the other. The medium to high but negative correlations between postpartum doe weight indicate that increase in postpartum doe weight resulted in some decrease in the other variables. Akpa *et al.* (2011) had reported medium correlation values between reproductive parameters in goat.

CONCLUSION AND RECOMMENDATION

Female reproductive indices varied with factors in the study. The diets containing cassava peel meal had longest gestation periods and age at first kidding irrespective of breeds. The study has provided useful information on the reproductive biology of the two goat breeds which hitherto were not available in the study area.

Browse such as Ficus, Gmelina and others should be properly established and conserved in the study area in view of their usefulness in goat and, indeed, general ruminant production. The reproductive information provided by this study could be used as baseline data and guide to surrounding farmers for fertility improvement in their herds.

Table 2: Correlation matrix of some reproductive parameters of does of WAD and Sahel goats

	Age at first oestrus	Oestrus period	Oestrus length	Gestation length	Age at first kidding
Oestrus period	-0.1785*				
Oestrus length	0.0190ns	-0.1204ns			
Gestation period	0.1575*	-0.0546ns	-0.2127*		
Age at first kidding	0.1931*	-0.0738ns	-0.1822*	0.3440**	
Postpartum doe weight	--0.0202ns	-0.2627*	-0.0296ns	-0.5852**	-0.4009**

*-P< 0.05. **=P<0.01, ns= not significant

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