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Response of multiparous and primiparous West African Dwarf goats (*Capra hircus,* L.) to concentrate supplementation

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ABSTRACT

The effects of parity and plane of nutrition on mass during gestation and the post-partum periods were studied in 36 adult West African Dwarf (WAD) goats assigned to three planes of nutrition for a period of 2 years. There was general mass gain in all the groups during gestation. Mass gain in high supplemented group (A) was significantly superior ($P<0.05$) to the gain in un-supplemented group (C), but not in medium supplemented group (B). Similarly, mass losses occurred in all groups post-partum. The mass losses were not significantly different between the groups. Mass changes in the does were not influenced by litter types. Dams giving birth to only singleton gained 4.4 ± 0.55 kg during gestation. The corresponding value for twin-bearing does was 6.13 ± 0.80 kg. Pre-partum mass gains were positively correlated with pre-weaning mass losses in all groups. However, significant differences ($P<0.05$) were observed in groups A and B, but not in group C. Parity had no significant effect within groups A and B, but does (dams) in group A significantly gained more mass ($P<0.02$) than groups B and C. There was a progressive mass increase with advancing pregnancy in all the groups. Group A does had significantly higher daily mass gain than group C during 1-140 days ($P<0.05$), 50-140 days ($P<0.05$) of pregnancy. It was concluded that nutrition and parity significantly affected the mass changes during gestation and the post partum period.

Key words: multiparous, primiparous, concentrate, parity goat, West African Dwarf goat, Nigeria

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Introduction

Agricultural development in Nigeria has placed more emphasis on crop production, although the rearing of cattle, sheep and goats have always formed an integral part of the domestic economy and source of wealth for the transhuman pastoralists. The consequence of this imbalance is that most Nigerians consume far less than the recommended minimum daily protein of animal origin (ANONYMOUS, 1980; AWOTWI and FYNN, 1992).

Goats are multipurpose animals, producing milk, meat, skin and hair. Goats own their existence to the fact that they thrive as meat producers under conditions which are difficult for other species of domestic livestock to survive (WILLIAMSON and PAYNE, 1984; ANONYMOUS, 1984; ANONYMOUS, 1980). Reports have shown that apart from poultry, the goat is the most numerous when compared to other domestic livestock species in Nigeria.

There are two main breeds of goats in Nigeria - the Red Sokoto (RS) and the West African Dwarf (WAD). While WAD goats are predominant in the hot, humid forest zone of southern Nigeria, the RS are found mainly in the dry north. WAD goats have developed a high tolerance to excessive humidity and trypanosomiasis, both of which are important factors in animal production in a forest zone (UPTON, 1985).

The reproductive pattern of cattle is reported to be higher during the rainy season (LAMORDE and WEINMANN, 1992; STEINBACH and BALOGUN, 1972). In contrast, reports on goats indicate that mass losses in non-pregnant adult goats were higher during the wet season (IKWUEGBU and OFODILE, 1992) when feed materials offer was reduced.

The objective of this study was to evaluate the influence of parity and nutrition on mass changes at different periods of gestation and in the post partum period.

Materials and methods

Animals and management. Thirty-six clinically healthy adult (WAD) female goats (does) were used for the study on the influence of parity and nutrition on mass changes at different periods of gestation and the post-partum periods. When indicated, breeding was done with three clinically

healthy adult WAD bucks. The does were acclimatized for 30 days, during which period they were fed 1 kg/head/day of a standard goat ration containing 20% maize-base concentrate (Table 3). Mass of the animals were determined weekly using a suspension spring balance.

All does were housed in roofed concrete floored pens with low concrete walls. Clean water and fresh grasses, consisting of giant star and centrosema, were constantly available.

Medication. Routine medication consisted of regular de-worming with Banninth F® (morantel citrate monohydrate + oxydozanide; Pfizer Products Plc. Ikeja, Nigeria) and ectoparasitic treatment was carried out with either Gamatox® (Gamma BHC, Chemical and Allied Products Ibadan, Nigeria) or Asuntol/coumafos® (Bayer, Leverkusen, Germany). Animals were vaccinated against peste des petit ruminants using tissue culture rinderpest vaccine (TCRV, Nigerian Veterinary Research Institute, Nigeria).

Experimental grouping. Following acclimatization the does were divided into three groups (A, B and C) of 12 does per group (A, B and C) after equalization in mass. Each group consisted of 6 pluriparous (nanny) and 6 primiparous (virgin) does. Group A does were fed with 1 kg/head/day of standard goat ration, consisting of 20% corn meal, 20% palm kernel cake, 20% wheat offal, 37% brewers dry gain, 2.75% groundnut cake and 0.25% salt (sodium chloride.) Group B received 0.5 kg/head/day, while group C does received no concentrate supplementation. Composition of the feed and nutritional values is presented in Table 3.

Breeding. Does in oestrous were bred with one of the three bucks whose physical characteristics were found to be satisfactory. Gestation lengths were recorded.

Data analysis. Data was subjected to general linear models procedure and Duncan's Multiple Test (DUNCAN, 1955). The Student t-test and chi-square test were also utilized (Statistical Analysis Systems, User's guide, version 6.03, 1987, SAS institute Inc, Cary, North Carolina, USA.). The levels of significant differences were generally taken to be at the 95% confidence interval ($P<0.05$), while correlation analysis was performed using the Pearson Correlation coefficient.

Results

Mass changes during the reproductive cycle. Changes in live mass of does during gestation are shown in Table 2. Generally, there were mass gains in all groups during pregnancy. Mass gain in group A was significantly superior ($P<0.05$) to the gain in group C, but not in B. Similarly, mass losses occurred in all the groups postpartum; at 90 days post-partum, when the kids were weaned, the mass of the dams had not attained the mass at breeding. The differences in mass losses were not significant between the groups.

Mass changes in WAD does showed that litter type had no significant influence. Dams giving birth to only singletons gained 4.40 ± 0.5 kg between breeding and parturition. The corresponding value for twin-bearing does was 6.13 ± 0.80 kg. Does bearing only twins in each group lost more mass during the pre-weaning period compared to does bearing only singletons.

The rate of twinning within the groups was not sufficient for statistical analysis. However, mass changes in dams were not significantly influenced between or within the groups in does giving birth to only singletons.

Mass gains were higher in group A and B that were fed concentrate supplements, than in group C. Mean mass loss was higher in group B than groups A and C. Differences were not significant.

It was observed that mass gains between breeding and parturition were generally higher ($P<0.05$) than mass losses, irrespective of level of feeding in does that gave birth to singletons. Pre-partum mass gains were positively correlated with pre-weaning mass losses in all groups. However, more significant differences were observed in groups A and B, than in group C.

While mean mass gain during gestation was 0.0 ± 077 kg in group A, groups B and C gained 5.70 ± 0.62 kg and 3.14 ± 0.80 kg, respectively. Pre-weaning mass losses for the groups were 4.33 ± 0.66 kg, and 3.04 ± 0.60 kg for A, B and C, respectively.

Effect of parity on mass gains during gestation. Data from 37 gestations were analysed to determine parity effects on mass changes during gestation. Results are summarized in Table 1.

Table 1. Mass changes (kg) (mean ± SE) in pluriparous and primiparous WAD goats during pregnancy

Group	A	B	C
	1kg concentrate/day	0.5 kg concentrate/day	No concentrate
Pluriparous	6.7[a] (9)	4.37[b] (9)	3.39[b] (9)
Primiparous	4.96 ± 0.68 (9)	4.00 ± 1.12 (3)	-

a, b = means with different superscripted letters differ significantly (P<0.002)

() = number of observations

Parity had no significant effect within groups A and B, but does (dams) in group A gained more mass (P>0.02) than groups B and C. There were no pregnancies in primiparous does in group C. When the data of animals in each group were pooled and compared, the mean mass gain (5.85 ± 0.48 kg) in group A was significantly higher (P<0.03) than those in groups B (4.28 ± 0.76 kg) and C (3.39 ± 0.80 kg).

Table 2. Weekly mass gain (kg) (mean ± SE) during gestation in WAD goats on 3 levels of

	Mass gain per group		
Period days	A (n = 18)	B (n = 12)	C (n = 7)
1-50	1.28 ± 0.25 (26)	0.89 ± 0.28 (18)	1.34 ± 0.40 (27)
1-100	3.53 ± 0.43 (35)	2.55 ± 0.48 (26)	2.76 ± 0.61 (28)
1-140	5.85 ± 0.48 [a] (42)	4.28 ± 0.76 [ab] (31)	3.39 ± 0.80 [a] (24)
50-100	2.23 ± 0.38 (42)	1.99 ± 0.32 (40)	1.44 ± 0.37 (27)
50-140	4.66 ± 0.46 [a] (52)	3.3 ± 0.64 [ab] (39)	2.01 ± 0.50 [b] (22)
100-140	2.39 ± 0.31 [a] (60)	1.44 ± 0.40 [ab] (36)	0.57 ± 0.35 (14)

n = number of observations; a, b, ab = means with different superscripted letters differ significantly (P<0.02)

( ) = average daily mass gain (g)

Effect of place of nutrition on mass changes at different periods of gestation. Data on mass changes during gestation in goats were analysed for 6 periods. This was done to determine the stage of gestation when supplementation is most indicated. The periods were: 1-50 days, 1-100, 1-140 days, 50-100 days 5-140 days, and 100-140 days of gestation correlation between mass changes during these periods. The mass of kids was also analysed.

Table 3. Composition of the standard goat ration used in study

Ingredients	%
Corn meal	20.00
Palm kernel cake	20.00
Wheat offal	20.00
Brewers grain	37.00
Groundnut cake	2.65
Salt (NaCl)	0.25
Minovit super	0.10
Total	100.00

There was a progressive mass increase with advancing pregnancy in all groups (Table 2). Group A does had significantly higher weekly mass gains than group C during periods 1-140 ($P<0.05$), 50-140 ($P<0.01$) and 100-140 days ($P<0.005$). The differences between groups A and B and between groups B and C were not significant. Unexpectedly, group B did have a lower weekly mass gains period, 1-50 days and 1-100 days, than group C. However, weekly mass gains in group B were higher than in group C during other periods. Lower weekly mass gains were recorded in groups B and C during periods 50-140 days and 100-140 days. A lower weekly gain of 14 kg was observed in group C during the last trimester of pregnancy.

Discussion

There appears to be no information available on mass changes during pregnancy in goats. Concentrate supplementation in this study had a positive effect on the reproductive performance of WAD goats. The high fertility and prolificacy observed in the highly supplemented group (A) agreed with the findings of AWOTWI and FYNN (1992). However, KLEEMANN et al., (1991) and GUNN et al. (1991) reported that the level of feeding had no effect on fertility of ewes, although live mass were inferior in ewes on low planes of nutrition. Between these extremes, GUESSOUS et al. (1989) found that concentrate supplementation tended to significantly increase fertility but not prolificacy in ewes. These differences might suggest species differences in response to nutritional level.

The inferior fertility and prolificacy rate in groups B and C in this study could have been caused by reduced ovarian activities, embryonic deaths and undetected abortions. As the number of pregnant does was determined from parturition, it was observed that there were more parturitions in group A than B, while parturition rate was higher in group B than in group C. This showed that oestrous cycles resumed earlier in group A than in groups B and C. This observation agreed with the findings of WILTBANK et al. (1992) in cows in which a high post-partum level of nutrition increased the percentage of cows exhibiting oestrous, while lower levels of energy post-partum resulted in longer intervals from parturition to the first, and reduced ovulation rate in cows. The results also agreed with the reports of others workers MANZANO et al. (1987) and JARRIN et al. (1988) in cows. While in pluriparous does in group C, prolonged anoestrous was observed (IMAKAWA et al., 1986; RICHARDS et al., 1989; RANDEL, 1990), cyclicity was severely disrupted in primiparous does in the un-supplemented group. The benefit of concentrate supplementation was also observed in the birth mass of kids in the different groups.

The result of this study also showed a progressive level of the nutrition. However, a significant mass gain group in group A compared with group C showed the positive influence of concentrate supplementation during pregnancy in goats.

It was also observed that the level of supplementation in group B was inadequate for optimum mass gain during pregnancy. The periodic mass gains indicated that during the earlier stages of gestation, the level of feeding was adequate in all groups. Towards the third trimester of gestation, the nutrients available to groups B and C were not adequate to sustain earlier mass gains. This finding agreed with the reports of GUESSOUS et al. (1989) who reported that a decrease in quantity and quality of available biomass that grazing progressed was accompanied by a loss of live mass in un-supplemented ewes. It can be concluded that parity and nutrition have a significant influence on mass changes at different periods of gestation and in the per-weaning period. The former consequently influenced the birth mass of kids.

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SAŽETAK

Istraženi su učinci broja jarenja i različitih načina hranjenja na prirast tjelesne mase u 36 odraslih zapadnoafričkih patuljastih koza za vrijeme gravidnosti i u postpartalnom razdoblju tijekom dvije godine. U razdoblju gravidnosti životinje svih skupina dobivale su na tjelesnoj masi. Prirast je bio značajno veći ($P<0,05$) u skupini A koja je dobivala znatno više dodataka u odnosu na kontrolnu skupinu C. Značajna razlika u prirastu nije ustanovljena u skupini B s umjerenom količinom dodanog koncentrata. Gubitak tjelesne mase ustanovljen je u svih skupina nakon jarenja, ali nije ustanovljena značajna razlika u njezinu gubitku između skupina. Promjena mase u

koza nije bila pod utjecajem tipa legla. Koze koje su ojarile jedno jare povećale su tjelesnu masu tijekom gravidnosti za 4,4 ± 0,55 kg, a one koje su ojarile 2 jareta za 6,13 ± 0,80 kg. Prirast tjelesnih masa u svim skupinama prije jarenja bio je u pozitivnoj korelaciji s njihovim gubitkom prije odbića jaradi. Značajne razlike ($P<0,05$) ustanovljene su između skupina A i B. Broj jarenja nije imao značajan učinak u skupinama A i B, ali su koze u skupini A imale značajno veći prirast mase ($P<0,02$) nego one u skupinama B i C. Tjelesna masa povećavala se sa stupnjem gravidnosti u svim skupinama. U razdoblju od 1-140 i 50-140 dana gravidnosti koze skupine A imale su značajno veći ($P<0,05$) dnevni prirast mase nego koze skupine C. Zaključuje se da hranidba i broj jarenja znatno utječu na promjenu tjelesne mase koza u tijeku gravidnosti i u postpartalnom razdoblju.

Ključne riječi: multipare koze, primipare koze, broj jarenja, zapadnoafrička patuljasta koza, Nigerija