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Effect of two different diets on growth from birth to sexual maturity of Nilotic does

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Abstract

The study aimed at evaluation of the growth performance of singleton Nilotic doe kids from birth to sexual maturity fed on complete pelletted molasses (PMD) or mash sorghum (MSD) based diets. Ten and 8 singleton doe kids born to dams fed the MSD (sorghum based concentrates and sorghum straw fed separately) and the PMD, respectively were reared on creep feeding with their dams till weaning (at 90 days of age). After weaning doe kids were allowed daily for 2 hours in the morning with an adult fertile buck. Feeding the two classes of diet had no significant effect on birth weight, weanling weight, age of sexual maturity, weight at sexual maturity and feed intake, however, FCR improved significantly in PMD fed does. Feeding of the PMD reduced intake cost by 52.6% and the cost of kilogram of body gain by 69.5%. It can be concluded that the Nilotic goats are small sized early maturing animals attaining sexual maturity at an early age and a light weight. It was also concluded that PMD is a good alternative to MSD; resulting in similar does' growth performance and low feeding cost.

Key words: Mash, Molasses, Nilotic, Pelleted, Sorghum

Introduction

Nilotic is the major goat breed of the Republic of South Sudan (Mason and Maule, 1960; Lako, 2010; Hassan, 2011). It has been noted that these goats live mostly on grazing poor natural pastures with no supplementary feeding or as scavengers in streets. Nevertheless, Nilotic goats play a very important role in the rural economy. Improvement of goats' management is an effective tool to alleviate poverty and improve food security in rural areas. Good management and care of female kids under intensive system allow them early attainment of puberty. Faruque et al. (2010) noted that Black Bengal goats on intensive rearing system showed first heat at 139 day of age compared with 198 day on semi-intensive rearing system. It was also reported that intensive system reduced the age at first kidding to 284.0±31.2 days compared with 370.0±25.5 days in semi-intensive system.

Information on growth performance of Nilotic goats within intensive systems is scarce. The importance of information on birth weight and body growth rate stems from the fact that future of any goat production investment depends upon successful program for raising kids for replacement of parent stock. High pre-weaning daily body gain not only reflects the genetic potential of growing animal but also the mothering ability of its dam, whereas, during the post–weaning period, nutritional status of the animal is an important factor to be considered (Lawrence and Fowler, 1997). It was also noted that faster growth rate resulting from higher plane of nutrition enable kids to attain puberty at younger age than kids reared on low plane of nutrition. Devendra and Burns (1983) added that early age at first kidding is desirable as it reduces the cost of rearing replacements, increases economic returns and facilitates rapid genetic progress.

Under intensive systems, feeding molasses-based diet should be preferred over the sorghum-based diet since this would reduce man-animal competition for cereals. The most recognized beneficial use of molasses is its addition to diets based on low quality roughages to improve palatability and provide a readily available source of energy. Feeding molasses-based diet would also produce a marked feeding cost reduction with comparable body performance (Atta and El Khidir, 2006; Adam et al., 2010).

The objectives of the current study are to evaluate: The pre- and post-weaning growth of Nilotic doe to sexual maturity under intensive feeding systems. And the efficiency of the complete pelletted molasses based diet (MPD) to replace the standard mash sorghum (MSD) based diet.

Materials and Methods

A research program was conducted at Juba University farm, 15 km north of the Khartoum Centre, to evaluate the reproductive and productive potential of Nilotic goats, transferred from Upper Nile State in the Republic of South Sudan. Goats were raised intensively under two feeding systems. The first was mash sorghum-based diet (MSD). Under this system animals were offered their daily meal in two separate portions i.e. mash sorghum based concentrate and sorghum straw roughage. In the second system, the animals were offered their feed as a complete pelleted molasses-based diet (PMD). The mash concentrate portion of MSD was composed of sorghum grains and groundnut cake as main sources of energy and protein, respectively. The PMD was formulated from urea and molasses as main sources of protein and energy, respectively; bagasses were incorporated as a major source of fiber content. The proximate analysis (Table 1) of the experimental diets was performed according to the AOAC (1980).

For the purpose of this study, 18 newly born singleton doe kids were used. The kids were assigned to the PMD (8 kids) and the MSD (10 kids) groups according to the feed of their dams. Birth weight of each kid was recorded immediately after delivery and drying. The kids were allowed to suckle their dams freely and kept on creep feeding up to weaning at 90 days of age and the weaning weight was recorded. After weaning they were kept on either of the two diet types in individual pens. For the MSD group, concentrate and sorghum straw portions were offered separately in the morning at the ratio of 1:1. The PMD diet was offered in a morning meal. The quantity of feed offered for the two groups was adjusted weekly to ensure about 10% weigh back. The refused feed was recorded daily to estimate feed intake of each animal. Fresh Alfaalfa (*Medicago sativa*) was offered at the rate of 500g per animal for both groups once a week as a source of carotene. Throughout the experimental period, animals had continuous free access to water and mineral licks.

Just after weaning the doe kids were freed with an adult fertile buck daily in the morning for 2 hours. Through close monitoring of the date of acceptance of the buck and appearance of estrus, the age and weight at first estrus were recorded. From the recorded daily feed intake, the average post-weaning daily intakes of dry matter (DM), metabolizable energy (ME) and crude protein (CP) were calculated (MAFF, 1975): DM intake, g/day = (DM % of the diet × average feed intake, g/day)/100; ME intake, MJ ME/day = ME concentration of the diet × DM intake, kg/day; CP intake, g/day = (CP % of the diet × DM intake, g/day)/100. For MSD treatment, the values were the sum of concentrate and sorghum straw intake was recorded separately.

Table 1: Ingredients and proximate analysis (%) of the experimental diets

Ingredients	Molasses based diet (PMD)	Sorghum based diet (MSD)	Sorghum straw
Crushed sorghum grains	20	32	
Molasses	35	-	
Bagasse	15	-	
Urea	1.5	-	
Salt	1.5	1	
Limestone	2	2	
Groundnut cake	10	36	
Wheat bran	15	29	
Total	100	100	
Proximate Analyses			
DM	90.3	92.4	93.0
CP	20.7	23.7	4.1
EE	2.2	5.6	1.17
CF	15.0	7.2	38.2
Ash	10.7	9.2	6.7
ME MJ/kg DM*	11.1	12.5	7.4

*Metabolizable energy was calculated according to MAFF (1975) formulae; PMD and MSD: ME (MJ/kg DM)= 0.012CP+0.031EE+0.005CF+0.014NFE; sorghum straw: ME (MJ/kg DM) = 13.9 – 0.017CF; Where, CP is crude protein, g/kg DM; EE is ether extract, g/kg DM; CF is crude fiber, g/kg DM; and NFE is nitrogen free extract, g/kg DM.

Statistical Analysis

Data of birth weight, weaning weight, pre- and post-weaning weight gain, feed intakes, age and weights at first estrus were subjected to analysis of covariance (season of birth being a covariate) (StatSoft, 2001) to test the significance of difference between the

Results and Discussion

Table (2) showed the overall mean does' body weights at birth and weaning (at 90 days of age) as well as age and weight at first esturs. The low coefficients of variation of these traits illustrated low level of discrepancies among animals. This indicated that the present values of the examined traits are intrinsic to this breed. Atta et al. (2011) also noted that body weights and ages of Nilotic male kids at different stages of development had small coefficients of variation (3.3–18.6%) indicating low level of discrepancy in these apparently genetically controlled traits. In the same context, Ahuya et al. (2009) reported (Toggenburg doe kids raised in smallholder production systems of the eastern highlands of Kenya), coefficients of variations of 21%, 19% and 10.9% for birth weight, weaning

weight and age at first kidding, respectively, however, the traits values (3.3 ± 0.66 kg, 19.1 ± 2.7 kg and 759.4 ± 82.8 days) were much higher than the present ones.

Table 2: Overall means of body weights of Nilotic doe kids

Traits	Mean	SD	CV%
Birth weight (kg)	1.8	0.3	16.9
Weaning weight (kg)	6.7	1.5	21.8
Age at Sexual maturity (days)	271.3	44.6	16.4
Weight at Sexual maturity (kg)	13.2	2.6	19.6

SD = Standard deviation; CV% = coefficient of variation

The birth weight of Nilotic doe kids was not affected by the feeding system of the dams (Table 3). Similar observations were reported by Atta et al. (2011) for Nilotic buck kids and Gubartalla et al. (2002) for Nubian doe kids. The present Nilotic doe kids had birth weight lower than 2.3 ± 0.5 kg (El-Abid, 2008) reported for Sudanese Nubian doe kids and than 2.4±0.02 kg reported for Sudanese Desert goats by Ismail et al. (2011). This may be attributed to the heavier mature weight of these heavy breeds (El-Abid, 2008). In the same context, AFRC (1993) stated that birth weight of sheep and goats is about 8.0% of mature weight; the present birth weight was 8.1% of does' weight at first kidding. This indicated that this birth weight was the maximum output of gestation for this type of goats. The weaning weight of doe kids in the current study was not affected by the experimental diet treatments (Table 3). This agreed with Gubartalla et al. (2002) who found 7.3±0.3 and 7.5±0.3 kg weaning weight for molasses and sorghum based Nubian doe kid groups (weaned at 90 days of age), respectively. The present doe kids weaning weight was lower than 8.4±0.1 kg reported for the Sudanese Desert goats by Ismail et al. (2011). However, much lower weaning weight (ranged between 4.0 – 5.7 kg) was reported for West African Dwarf doe kids by Hofs et al. (1992). During pre-weaning period both groups (PMD and MSD) had equal body weight gain (Table 4). Atta et al. (2011) reported similar observations and comparable values for male Nilotic kids fed the same present feed treatments (59.1 and 59.3 g/day for sorghum and molasses fed groups, respectively). The post-weaning body weight gain to sexual maturity was also similar for the two experimental groups (Table 4). Same observations were reported by Atta et al. (2011) for Nilotic buck kids (34.5 and 36.8 g/day for sorghum and molasses fed groups, respectively). In the present study, the daily post-weaning body weight gains were within the range (30-50 g/day) reported for West African Dwarf goats by Adebowale and Ademosun (1981).

The ages and weights at first estrus were not affected (P>0.05) by diet treatments (Table 4). Faruque et al. (2010) also noted that rearing system did not affect (P>0.05) age at first heat of Black Bengal kids. In the same context, Gordon (1997) stated that sexual maturity is mostly dependent on weight rather than age. The similarity of the present does' weaning weight and post-weaning body weight gain resulted in the similar body weights and ages at first estrus. However, the current values of age and weight at first estrus were lower than those reported by Gubartalla et al. (2002) for Sudanese Nubian goats (10.1 ± 1.4 months and 16.3 ± 0.02 kg). This indicated that Nilotic does are small sized and early maturing animals as reported for their male fellows by Atta et al. (2011).

The DM, ME and CP intakes during the period between weaning and sexual maturity did not show significant (P>0.05) variations among MSD and PMD groups (Table 4). Comparable intakes during the same period were found for male Nilotic kids by Atta et al. (2011). They reported the ranges of 331–363 g/day, 3.1–3.5 MJ/day and 50.5–62.4 g/day for DM, ME and CP intakes respectively. The ME intake of kids in the present study was comparable to that stated by NRC (1981) which is 424 KJ/kg/day for maintenance and 30.3 KJ/gm for daily body weight gain. Zemmelink et al. (1985) reported higher requirements for West African Dwarf goats (410 KJ/kg/day and 38.0 KJ/gram of body gain as daily energy requirement for maintenance and daily body weight gain, respectively). The improvement of feed conversion ratio (FCR) as a result of the feeding of pelletted molasses diet observed in this study (Table 4) might be due to the fact reported by Morand-Fehr (2003). He noted that feed eating habit of goats causes more waste when feed is offered in flour or mash form rather than pellet. El Khidir et al. (1989) reported that molasses when mixed with wheat bran reduces its wastage during feeding.

The costs of one kilograms of feed intake and body weight gain in Sudanese pounds (1 SDG = 0.333 US$) were significantly (P<0.05) higher for MSD groups (Table 4). It is noteworthy that feeding PMD reduced the feed intake cost by 52.6% and the cost of one kilogram of body weight gain by 69.5%. Similar findings were reported by Atta and El Khidir (2006) for Nilotic rams and Atta et al. (2011) for Nilotic buck kids fed molasses-based diet (55.1% and 43%, respectively) with comparable fattening performance and similar carcass characteristics.

Conclusions

This study concluded that Nilotic goats are of small size and light weight which attain sexual maturity at an early age. The study also concluded that pelleted molasses based diet is a good alternative to mash sorghum based diet, resulting in similar does' performance and low feeding cost.

Table 3: Body weights of Nilotic doe kids fed on PMD and MSD

Traits	PMD	MSD	SE	Level of sign.
No of observations	8	10		
Birth weight (kg)	1.96	1.71	0.137	NS
Weaning weight (kg)	6.66	6.78	0.676	NS
Age at sexual maturity (days)	268.0	274.2	16.03	NS
Weight at sexual maturity (Kg)	14.4	12.2	0.76	NS

In this table and the following; SE = standard error of means; Level of sign. = Significance of difference between treatments' means; NS = Mean on the same row are not different (P<0.05)

Table 4: Growth and intake performance of Nilotic doe kid fed PMD and MSD

Traits	PMD	MSD	SE	Level of sign.
No. of observations	8	10		
Pre-weaning weight gain (kg/day)	0.052	0.056	0.007	NS
Post-weaning weight gain (kg/day)	0.043	0.032	0.005	NS
DM intake (g/day)	369.4	384.9	18.54	NS
ME intake (MJ/day)	3.45	3.60	0.173	NS
CP intake (g/day)	83.52	77.52	3.80	NS
FCR (kg DMI/ kg wt gain)	8.57	14.36	1.790	*
Feed intake cost (SDG/kg)	0.18	0.38	0.013	*
Cost of body weight gain SDG/kg/day	4.18	13.72	1.676	*

SDG = Sudanese pound (1 SDG = 0.333 US$); *= Means on same row are significantly different (P<0.05)

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