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The Effect of forage based diets on milk Composition, Lactation stages and Growth Rate kids from West African dwarf (WAD) goat in South West Nigeria

Dupe Olufunke Ogunbosoye[1] and Olaniyi Jacob Babayemi[2]

[1]National Centre for Genetic Resources and Biotechnology (NACGRAB) Moor Plantation, Ibadan.
[2] University of Ibadan, Department of Animal Science, Nigeria

Abstract

In Nigeria, there are three dominant breeds of goat in the hand of smallholder farmers. These are Sahel, red sokoto and West African dwarf (WAD) but the most common breed in southern part of Nigeria is WAD goat. The study, therefore, investigated effects of five different forages using *Panicum maximum* as control on milk composition, stages of lactation and growth rate of WAD goat kids. Twenty one (21) WAD does with their kids were randomly allotted to different forages in a complete randomized design. The forages are: *Albizia odoratissima*, *Gliricidia sepium*, *Leuceana leucocephalla*, *Spondias mombin*, *Ficus thonningii* and *Panicum maximum* as control. The forages are available all year round suggesting their utilization as dry season feed for ruminants. All forages except *P. maximum* contained, per kg of dry matter (DM): 14-24 % crude protein (CP), 5-9 % ash, and 45-60 % neutral detergent fibre (NDF). Animals were supplemented with a compounded ration at 2% body weight.

The lactation length was 12weeks (84days) and the effect of diet on milk composition was significant ($p<0.03$) with a CP content ranging from 3.10 to 3.92%), milk fat 3.5 to 4.2%, solid-not-fat 11.7 to 13.30%, and total ash (0.76-0.96%). The highest value for CP in milk was found for the treatment with *Gliricidia sepium*. Also, the contents of milk protein (3.00 to 3.80%), fat (3.47 to 3.88%) solid not fat (11.31 to13.24%), lactose (4.20 to 4.53%), total ash (0.64 to 0.91%), and total solid (14.83 to 17.12%) varied significantly ($p<0.05$) among the different stages of lactation. In contrast, the pH of milk (6.75 to 6.99) did not very among the treatments. The weaning weight of kids at twelve weeks of age was found to be significant ($p<0.005$) different. This value ranged between 3.73 and 5.47kg. The study revealed that forage quality had effect on milk composition which then influenced weaning weight of kids.

It is therefore suggested that browse plants or concentrate supplementation should be encouraged for low quality pasture like guinea grass.

Keywords: Forages, milk composition, WAD goat, weaning weight

Contact address: Dupe Olufunke Ogunbosoye, National Centre for Genetic Resources and Biotechnology, Animal Genetic Resources Unit Moor Plantation, +234 Ibadan, Nigeria, e-mail: bosoyeme@yahoo.com

INTRODUCTION

Feed constitutes over 70% of total production cost. Livestock production in the tropics is influenced by the availability of feed resource during a particular season of the year (Ogunbosoye and babayemi 2008). Multipurpose trees and shrubs (MPTS) are feed resources that contribute cheaply to the nutrition of livestock in the tropics all year round. Their immense contribution is mostly felt during the lean period of the year where most available grasses lignified (Babayemi 2007).

Milk is essentially necessary for the nutrition of newly born animals. The nutrient in milk is similar for species but different proportions. Milk quality is dependent on the nutrients of the feed. It was reported of Holter et al, (1982) that protein content of milk increased when dietary protein of cows of similar age, stage of lactation and milk production potential increased from 11 to 16 %. The work conducted by Jaquette et al (1986) when 13 and 23 % crude protein dietary levels were fed to lactating animals could not show results that were attributed to increase or decrease in milk protein. Meanwhile, Sutton et al., (1980) reported an increase in protein milk of 0.4 % units in dairy cows when the forage: concentrate ratio decreased from 40:60 to 10:90. Min et al., (2005) stated that dietary characteristics influence milk yield and milk composition of dairy goats, as well as body weight gain. Previous studies have also shown a positive correlation between both the amount and the concentration of metabolizable energy and either milk protein or yield (Casper et al., 1990). Recently in Nigeria, there are no much extensive studies carried out on the effect of forage diets on milk composition of WAD goats. Therefore, the objective of this study was to determine the effect of different forages on milk composition and body weight gain of West African dwarf goat's kids.

MATERIALS AND METHODS

Forages used are: *Leucaena leucocephala* (L), *Gliricidia sepium* (Gl), *Albizia odoratissima* (A), *Ficus thonningii* (F), *Spondias mombin* (S), *Panicum maximum* (Gr) and were supplemented with concentrate (C) at 2 % body weight. The study was conducted at Animal Genetic Resources Unit of National Centre for Genetic Resources and Biotechnology (NACGRAB) Moor Plantation, Ibadan. Forages were harvested fresh and fed the following day to the animals.

Animals and management

Twenty one (21) WAD does were used. The weight was between 15-20 kg. The does were individually penned with wood shaving as their beddings. The quantity of feed offered and the orts were measured to determine feed intake. The animals had free access to fresh water ad libitum. Weight of kids and does were taken weekly. Kids were allowed to run with their does throughout the experimental period.

Chemical composition of the feed samples

Each fresh sample consists of leaves and small part of stems were oven-dried to constant weight at 105^{o}C for 2 days to determine dry matter (DM) and later ground to pass through 1mm sieve for later use. Crude protein (CP), ether extract (EE), crude fibre (CF), ash content of the fodders were determined as outlined (AOAC, 1990). Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were analyzed (Van Soest *et al*., 1991). Milk samples were collected once a week over 12 weeks of lactating period, bulked together in plastic sample bottles mixed and stored in deep freezer at -5°C till required for analysis and analyzed for crude

protein, lactose, fat, total solid, solid-not-fat, total ash and milk pH according to A.O.A.C (1990).

Statistical Analysis

Data obtained were subjected to statistical analysis using ANOVA procedure of SAS (1987). Significant means were compared by Duncan option of SAS (1987).

RESULTS AND DISCUSION

The chemical composition of the browse species is presented in Table 1. Dry matter (DM) of the feed resources varied from 22% in Ficus to 35% in Leucaena. The ash content was lowest (5%) in Albizia while Ficus spp the highest (12 %). Ether extract (EE) which signifies fat content of the diet was also lowest in Panicun (3 %) but highest in Leucaena and *Gliricidia spp* (12 %). The crude protein (CP) contents of the browse species ranged from 7 % in Panicum to 24 % in *Leucaena* spp. Variations were also observed in fiber fractions of the fodders. Neutral detergent fibre (NDF) varied from 45 % in Luecaena to 73 % in Panicum. Acid detergent fibre ranged between 32 % in Leucaena and 48 % in Ficus. Again, Acid detergent lignin (ADL) contents were ranged from 6 % to 12 %. The DM and ash content obtained were similar to those reported of earlier work (Yavuz Gurbuz, 2007). The level of CP of the browse spp agreed with the reports of Omokanye, (2001). However, CP content of the browse spp are within the range required for optimum performance of WAD goats expect for *Panicum maximum* which fell below the minimum requirement for ruminants (7%) (Minson,1990). The fibre contents of the plant species were consistent with the report of other workers (Larbi et al 1996). Although, Meissner et al (1991) reported that browse spp with NDF above 55-60 % will reduce the intake of such fodder by ruminants, this did not follow in this work because those plants with higher NDF (Ficus and panicum) were well consumed. It then showed that many other factors could be responsible for the consumption of fodders by ruminants.

The gross milk composition of West African dwarf does' milk as reflected by crude protein (% CP), total ash (%), total solid (% TS), solid-not-fat (% SNF), lactose (%) is presented in Table 2. The effect of diets on milk composition was significant ($P < 0.05$). Milk protein and fat ranged from 3.10 to 3.92 and 3.51to 4.16 respectively. Lactose and total ash composition varied from 4.28 to 4.59 and 0.73 to 0.97. Meanwhile, the values were in variance with the result of previous study (Akinsoyinu, et al., 1977 and Mech et al., 2008). Figure 1 reflected the birth weight and litter size of kids. It was revealed that there is a significant difference ($P < 0.05$) in the birth weight and litter size of kids. The average birth weight of animals fed with Leucaena was the highest (1.57 kg) while animals fed with grass only recorded the lowest (1.17 kg). Presented in Figure 2 is the pH values of milk of WAD does which did not show any significantly different. The result agreed with the report of Alfa-Laval, (1980)

Presented in Table 3 is the mean milk composition of WAD does fed different forages with advancing lactation. Milk components decreased with advancing lactation except lactose that shoot up in the second month but drooped gradually till the end of lactation period. The decreased level of milk protein as the lactation day increased was in agreement with earlier reports (Devendra, 1972; Akinsoyinu et al., 1977 and Mech et al., 2008).

Likewise the weaning weight of the kids ranged from 3.73 to 5.47kg (Figure3).The mean live weight gain of kids increased with the level of crude protein content of the forage fed to the does. Min et al (2005) observed that the value of a feed for animal production depends on its quality and level of voluntary feed intake in small ruminants. This could be due to the higher milk

production and composition of does with increasing protein in diets. Growth of kids was found to be dependent on quantity of milk (Robinson, 1990). Low level of nutrition was reported to reduce milk yield and composition which may have deleterious effect on the rate of weight gain of kids (Odubote et al., 1993; Madibela et al 2002). The weaning weight of kids under Albizia treatment was lower than that of kids under Leucaena. This is because kids reared as single grow faster and heavier at weaning than the kids reared as multiple. This observation was consistent to the report of Madibela et al (2002) and Ola and Egbunike, (2007).

Table 1: Chemical composition of the forages (%)

Parameters	*Leucaena leucocephala*	*Gliricidia sepium*	*Albizia odoratissima*	*Spondias monbim*	*Ficus thoningii*	*Panicum maximum*
DM	32	25	41	32	22	34
CP	24	20	16	16	14	7
Ash	9	8	5	7	12	11
EE	12	12	9	11	10	3
NDF	45	49	60	55	64	73
ADF	32	34	33	40	48	37
ADL	6	7	9	8	12	9

Table 2: Milk composition (%) of WAD does milk fed different forages

Diet	Protein (Nx6.38)	Milk fat	Solid not-fat	Lactose	Total ash	Total solid
Gl+C	3.92a	3.56c	12.39b	4.59a	0.77b	16.03b
A+C	3.82a	3.51c	12.19b	4.56ab	0.73b	15.71b
L+C	3.72a	3.84b	13.30a	4.54ab	0.97a	17.14a
F+C	3.38b	3.53c	11.73b	4.32ab	0.76b	15.26b
S+C	3.19b	4.16a	11.85b	4.39ab	0.79b	16.01b
Gr+C	3.10b	3.63c	11.78b	4.28b	0.79b	15.41b
SEM	0.07	0.04	0.15	0.05	0.02	0.16

abc = means on the same row with the same letter are not significantly (P>0.05) different

Table 3: Milk composition as affected by duration

Month	Protein	Milk fat	Solid not-fat	Lactose	Total ash	Total solid
1	3.80a	3.88a	13.24a	4.40a	0.91a	17.12a
2	3.43b	3.76a	12.32b	4.53b	0.82b	16.09b
3	3.17c	3.60b	11.71cb	4.42cb	0.73c	15.31c
4	3.00c	3.47c	11.31c	4.20c	0.64d	14.83c
SEM	0.07	0.04	0.15	0.05	0.02	0.16

abc = means on the same row with the same letter are not significantly (P>0.05) different

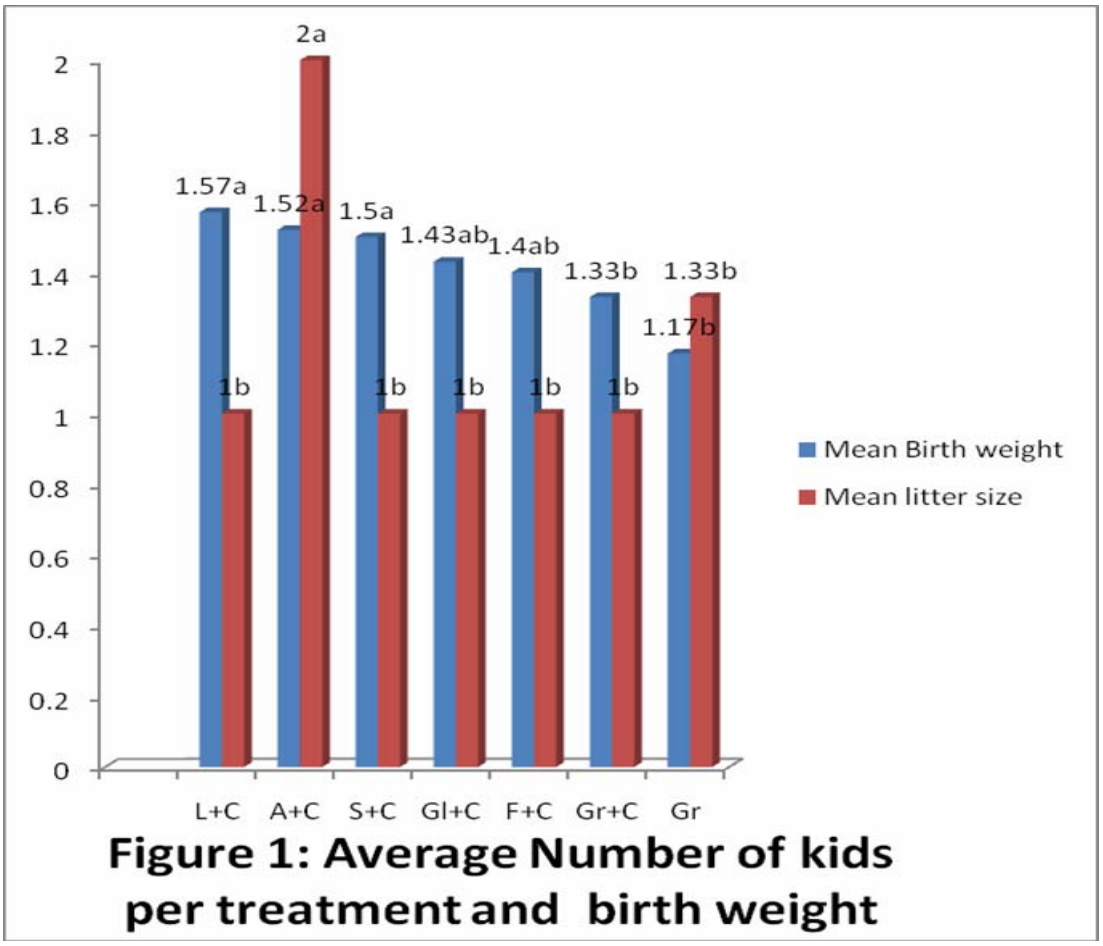


Figure 1: Average Number of kids per treatment and birth weight

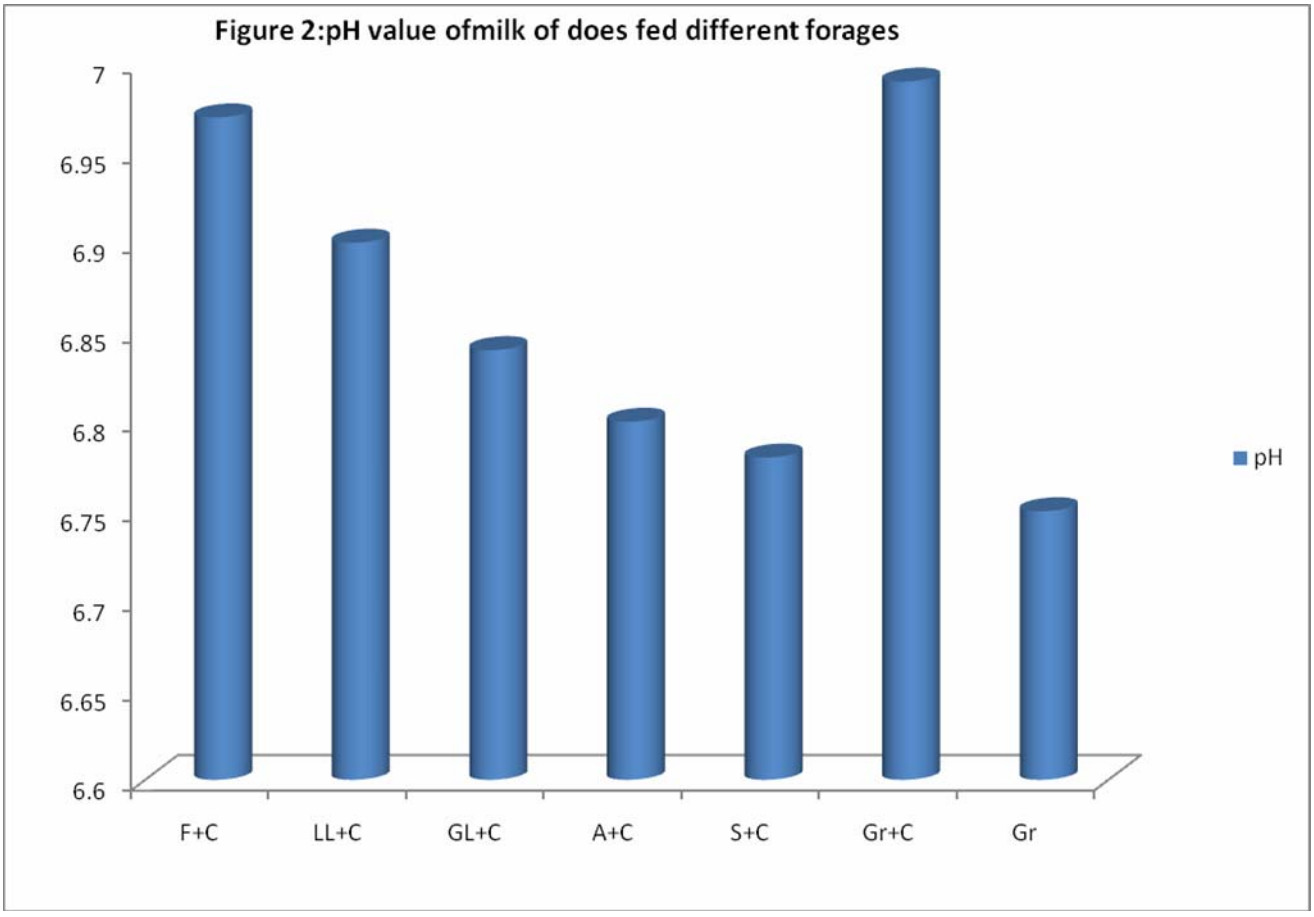
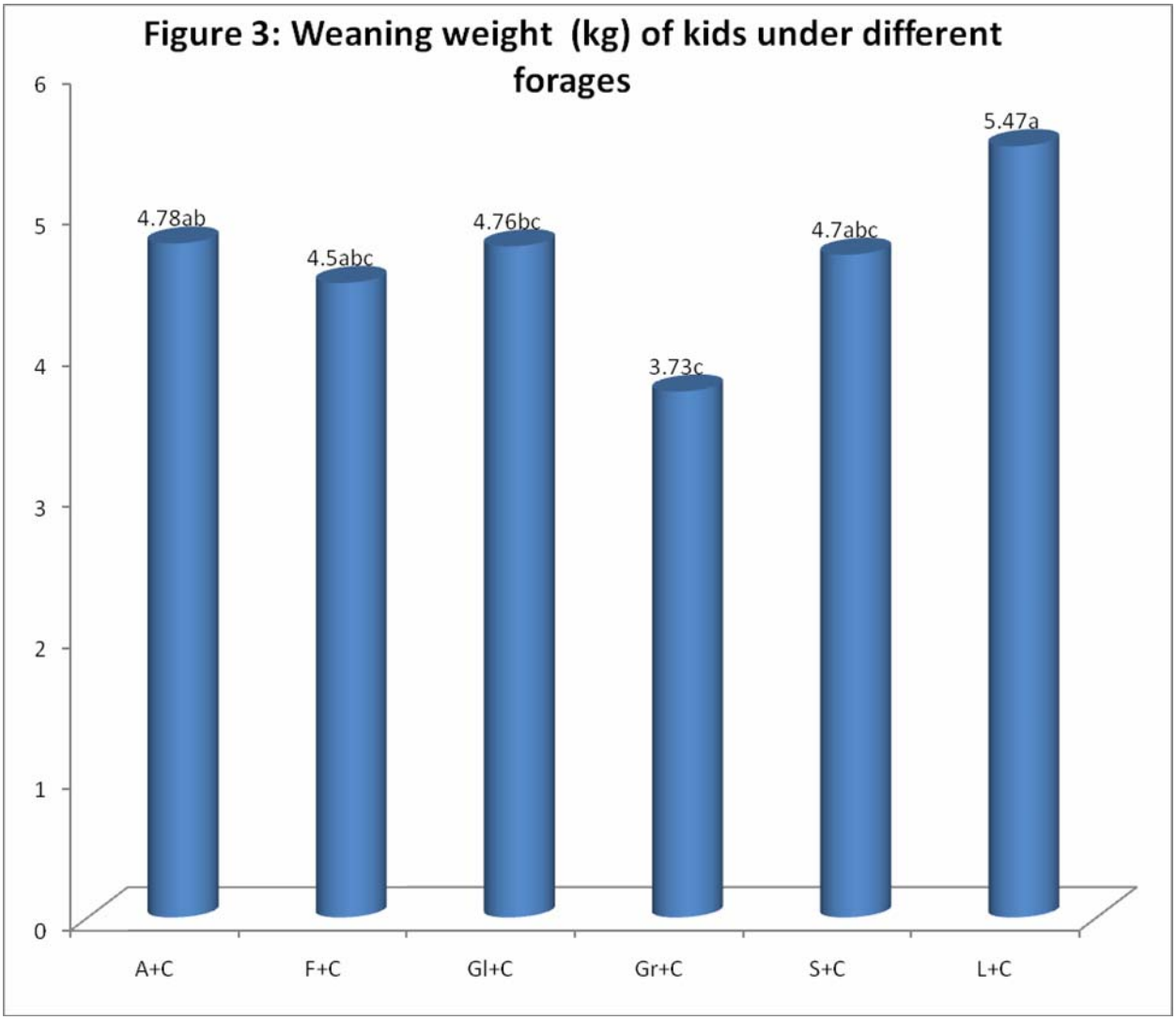


Figure 2:pH value ofmilk of does fed different forages
7
6.95
6.9
6.85
6.8
6.75
6.7
6.65
6.6
F+C
LL+C
GL+C
A+C
S+C
Gr+C
Gr
pH



Conclusion

It is therefore concluded that high quality forages can improve production and that browse plants or concentrate supplementation should be encouraged for low quality pasture like guinea grass

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