APRW -73

Effect of Week of Lactation and Selected Forage Types on Milk Yield Performance of West African Dwarf Goats

O.O. Adewumi., T.M. Raouf, S.T. Idowu, D.O. Aladeokin, A.A. Ajao, S.B. Ajakaiye, T.H. Akinde, A.A. Akande, O.O. Oyenekan, M.N. Nupo and G.O. Sanusi
Department of Animal Production and Health, College of Animal Science and Livestock Production,
Federal University of Agriculture Abeokuta, Nigeria
***Corresponding author:** O.O. Adewumi; E-mail: badewumi2003@yahoo.com. +2348034822547

Abstract
Twenty lactating does in their fourth parity, weighing between 15 and 20 kg live weight was used to evaluate the effect of week of lactation and selected forage type performance of West African Dwarf does. Nutrition was based on zero grazing on pasture species comprising of *Panicum maximum, Gmelina arborea* and *Mangifera indica*. Hand milking of the does was done at 06 – 07 h once in a week for a period of 8 weeks. The result showed that Week of lactation had significant effect on all parameters tested. The highest milk secretion rate (28.75 ml/hr), milk yield per day (618.18 ml) and does weight to milk ratio were recorded in week 3 while the least was recorded in week 8 of lactation. Milk yield was significantly higher ($p<0.01$) in WAD does fed *Magnifera indica*. Average daily milk yield was 555,17, 485.06 and 641.14 ml day^{-1} while mean body weight was 20.16, 15.13 and 19.04 kg for WAD does fed *Gmelina arborea, Panicum maximum* and *Magnifera indica* respectively. On body weight basis, milk yield was 29.42, 26.75 and 31.33 ml/kg^{-1} between day-1 body weight for WAD does fed *Panicum maximum, Gmelina arborea* and *Mangifera indica* respectively. Therefore, *Mangifera indica* could be used as alternative basal diet for West African Dwarf goat.

Keywords: Lactation, milk yield, West African Dwarf goats

Introduction

Goats are valuable domestic animals in the tropical livestock production system. They play an important role in economy, nutrition and welfare of the smallholder arable farmer in Nigeria (Khan *et al*., 2006). Goat milk is sweet, nourishing and medicinal (Mackenzie, 1967). *Panicum maximum* is the main forage fed to ruminant but becomes dry and lignified during the dry season. Pregnancy and lactation is energy demanding, there is need to find an alternative to *Panicum maximum* to forestall energy deficit during the dry season. *Gmelina arborea* and *Mangifera indica* are among the leading plantation tree species available all year round. The leaves remain green to the larger part of the dry season and have been fed to ruminants with the appreciable result. It is rich in protein and the protein content fall within the range of 10.01-38.4% as reported by Osakwe and Udeogu (2007). Studies have shown that *Gmelina arborea* leaf can be used as a cheap protein supplement which can improve voluntary intake, digestibility and general performance of animals fed low quality feeds (Kakengi *et al*., 2001). Mango leaves had 87.72, 3.25, 0.68, 28.23, 8.50 and 57.15% of dry matter, ash, ether extract, crude fiber, crude protein and neutral detergent fiber (Yusuf, 2011) but their effect on milk production in lactating goat is scanty.

The general objective of this study was to evaluate the effect of some selected forages on milk production of West African dwarf goat in the humid zone.

Materials and Methods

The study was conducted at the Federal University of Agriculture Abeokuta, Nigeria. Twenty WAD goats with an average weight of 15.13 - 20.16 kg were used for the eight weeks feeding trial. The animals were in their fourth lactation and intensively managed in cross ventilated pens with the slatted floor. They were supplemented on daily basis with concentrate feed of about 15% crude protein, compounded from maize (13%), dried cassava peel (15%), palm kernel cake (32%), groundnut cake (10%), wheat offal (24%), bone meal (10%), salt (10%), premix (0.5%) to ensure that nutritional requirements were met. Animals had access to water *ad libitum* and were routinely de-wormed and treated against ectoparasites.

After kidding, the dams were weighed to know the parturition weights, which were taken as the initial weights. Milk yield measurement was commenced after the kids were allowed to suckle the dams for the first seven days postpartum to consume colostrum and to establish strong dam–kid relationship to forestall rejection of kids by their dams after overnight separation to measure milk yield. Hand milking of the animals was done at 06 – 07 h once in a week. The kids were separated from their dams for 12 h overnight (6 pm – 6 am) and only re-introduced to their dams after milking. The milk was collected into 500 ml graduated plastic beaker. Values obtained were multiplied by a factor of 2 to get the milk yield for 24 h. This approach was continued for 8 weeks postpartum after which the kids were weaned.

Data collected were analyzed using one-way analysis of variance (ANOVA) as contained in SAS package (SAS, 2002) and Duncan multiple range tests were used to separate means where there were significant differences.

Results and Discussion

Means and standard errors for milk secretion rate, milk yield and milk per weight ratio as affected by week of lactation are shown in table 1. Milk secretion rate, milk yield and milk yield per kilogram body weight varied significantly ($p<0.05$) in a decreasing order throughout lactation. The highest milk secretion rate (28.75 ml/hr), milk yield per day (618.18 ml) and milk weight ratio were recorded in week 3 while the least was recorded in week 8 of lactation. Table 2 shows the effect of forage types on milk secretion rate, milk yield per day and milk per weight. All the parameters taken were significantly different ($p<0.05$). WAD does fed *Mangifera indica* recorded the highest milk secretion rate (26.71 ml/hr), milk yield per 12hrs (320.57 ml/hr), milk yield per day (641.14 ml) and daily milk yield per weight (31.33 ml/kg). Figures 1 and 2 show effect of selected forage type on daily milk yield (ml) and daily milk yield per weight of lactating WAD does. The highest milk yield was recorded on week 5 for *Mangifera indica* (712.8 ml) while *Panicum maximum* (366.25 ml) had the lowest value in week 8.

The average milk yield of 641.14ml was higher than 270.34 and 158.278 observed in WAD goats and 545.52 in Yankasa. The difference observed in milk yield of does in this study could be due to nutritional factors, management system adopted, parity and the live weight of the animal. The peak milk yield at 3rd week for WAD does on the selected forages used on the this experiment is in line with Adewumi *et al.* (2011)who reported that milk yield occurred in 3rd week of lactation in West African Dwarf. Adewumi *et al.* (2017) noticed that while milk of Kalahari red goat declined steadily after peaking at 1st week, the peak lactation of Payoya dairy goats extended until the 4th week of lactation (Delgago-Pertinez *et al.,* 2009). . Similarly, milk secretion rate was similar for the first six weeks and gradually declined towards the end which is lower than that reported by Egbowon *et al.,* 2007 but higher than 25.79 ml/hr reported by Sanusi *et al*. (2017). All of these physiological mechanisms result in a typical pattern of milk yield over time, characterized by an initial phase of increasing production which reach a maximum (peak lactation) and then declines more or less rapidly until dry-off (Grzesiak *et al.,* 2003).

The use of *Mangifera indica* and Gmelina improved the milk yield by 32 and 15% respectively due to its positive effect on the rumen environment, leading to increased rumen microbial output and that the protein in mango has good rumen bypass characteristics. The significant effect of selected forages on daily milk yield, milk secretion rate is in harmony with Ochoa-Coradeo *et al.* (2002) for Ramboullet ewe. In this study daily milk yield decreased from 591.83 ml in early lactation to 213.18 ml at 8th week. The observed trend of milk yield could have resulted from the proliferation of myoepitheliel cells of the mammary gland especially at the early stage of lactation which was available for milk synthesis at mid lactation and decreased rapidly until dry. In conclusion, feeding of *Mangifera indica* could be used as an alternative basal diet for West African Dwarf goat.

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Table 1: Effects of weeks on milk yield performance of West African dwarf goats

Weeks	Milk Secretion Rate (mls/hr)	Milk Yield per 12 hours (mls)	Milk Yield Per Day (mls)	Milk/Weight (mls/kg)
1	24.65[a]	295.81[a]	591.63[a]	31.55[ab]
2	25.42[a]	305.13[a]	610.27[a]	31.20[ab]
3	25.75[a]	309.09[a]	618.18[a]	34.58[a]
4	23.83[a]	286.00[a]	572.00[a]	29.69[ab]
5	24.81[a]	297.7[a]	595.45[a]	30.00[ab]
6	23.12[a]	277.5[a]	555.00[a]	28.43[b]
7	20.62[ab]	247.5[ab]	495.00[ab]	26.24[b]
8	17.76[b]	213.18[b]	426.36[b]	20.72[c]
SEM	0.63	7.65	15.3	0.73
P-VALUE	0.0204	0.0204	0.0204	0.0001

Table 2: Effects of forage types milk yield performance of West African dwarf goats

Forages	Milk Secretion Rate (mls/hr)	Milk Yield per 12 hours (mls)	Milk Yield Per Day (mls)	Milk/Weight (mls/kg)
Gmelina arborea	23.25±0.93[b]	279.08±11.18[b]	558.17±22.36[b]	29.42±1.12[ab]
Panicum maximum	20.21±0.92[c]	242.53±11.12[c]	485.06±22.25[c]	26.75±1.15[b]
Mangifera indica	26.71±1.29[a]	320.57±15.48[a]	641.14±30.96[a]	31.33±1.45[a]
	0.0001	0.0001	0.0001	0.0330

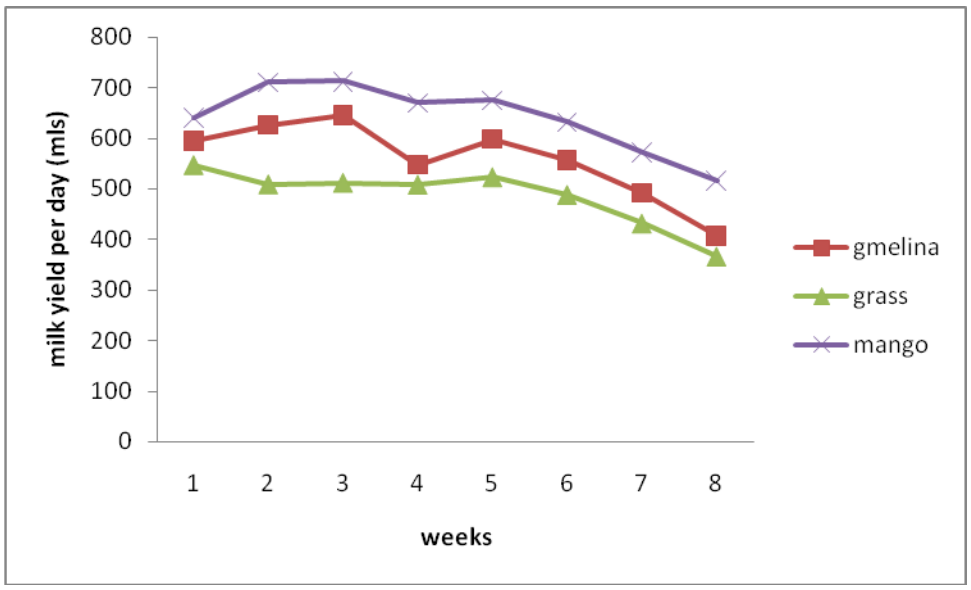

Figure 1: Effect of selected forage types on milk yield per day

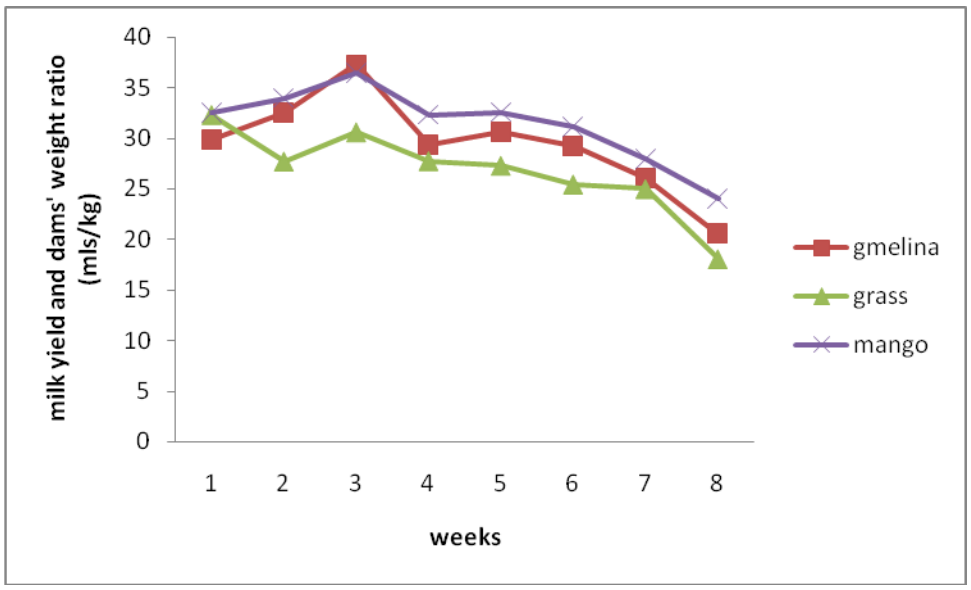

Figure 2: Effect of selected forage types on milk yield and dams' weight ratio