

Evaluation of locally available feed resources for dairy goat feeding in Kongwa district, Tanzania

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Abstract

An experiment was conducted to assess the effects of three concentrate diets made from locally available feed resources on milk production and growth rates of dairy goats kept by small-scale farmers in Kongwa district. The concentrate diets were based on sunflower seed cakes (SFSC), *Melia azedarach* leaf meal (MLM) and *Ficus spp.* leaf meal (FLM) as sources of protein in the diets formulated to contain iso-protein level of 13% CP. Four dietary treatments were tested i.e., SFSC, MLM, FLM and farmers' feeding practice. *Cenchrus ciliaris* hay and water were provided *ad libitum* to all animals. Twenty-four lactating does and 32 growing kids were used in a 90 day feeding trial to evaluate the effects of the diets on milk yield and growth performance, respectively. Six lactating does and eight growing kids were randomly allotted into each of the four dietary treatments. Each experimental animal was supplemented with 30 g/kg $W^{0.75}$ (on as fed basis) of MLM, FLM or SFSC. Results showed that the animals supplemented with the concentrate containing SFSC, MLM and FLM had significantly higher ($P \leq 0.001$) milk yield, body weight gain and growth rate than the animals under the farmers practice. Animals supplemented with diets containing SFSC had the highest milk yield (339.33 ± 18.61 lire), body weight gain (10.30 ± 0.32 kg) and growth rate (114.43 ± 3.53 g/d), followed by those on MLM diet and lastly those on FLM. It is concluded that *Melia azedarach* leaf meals and *Ficus spp.* leaf meals are potential protein sources for use in formulating dairy goat rations in place of the expensive commercial concentrates.

Key words: Growing kids, growth rate, lactating goats, milk yield, supplementation, weight gain

Résumé

Une expérience a été menée pour évaluer les effets de trois régimes concentrés fabriqués à partir de ressources alimentaires localement disponibles sur la production laitière et les taux de croissance de chèvres laitières gardées par les petits fermiers

dans le district de Kongwa. Les régimes concentrés ont été basés sur les pâtisseries de graines de tournesol (SFSC), la farine des feuilles de *Meliaazedarach* (MLM) et de *Ficus spp.* (FLM) en tant que des sources de protéines dans les aliments formulés pour contenir le niveau des iso-protéines de 13% CP. Quatre traitements alimentaires ont été testés à savoir, SFSC, MLM, FLM et la pratique d'alimentation des fermiers. Le foin de *Cenchrusciliaris* et l'eau ont été fournis *ad libitum* à tous les animaux. Vingt-quatre femelles allaitantes et 32 petits en pleine croissance ont été utilisés dans un essai d'alimentation de 90 jours pour évaluer les effets des régimes alimentaires sur la production laitière et la performance de croissance, respectivement. Six femelles en lactation et huit petits en croissance ont été aléatoirement attribués dans chacun des quatre traitements alimentaires. Chaque animal expérimental a été supplémenté de 30 g / kg W0.75 (en tant que base de nourriture) de MLM, FLM et SFSC. Les résultats ont montré que les animaux supplémentés avec le concentré contenant SFSC, MLM et FLM avaient significativement le rendement en lait ($P < 0,001$), le gain de poids corporel et le taux de croissance plus élevés que les animaux sous la pratique des fermiers. Les animaux supplémentés avec des rations alimentaires contenant SFSC ont eu le rendement le plus élevé en lait ($339,33 \pm 18,61$ litre), en gain de poids corporel ($10,30 \pm 0,32$ kg) et en taux de croissance ($114,43 \pm 3,53$ g / j), suivis par ceux sous alimentation en MLM et enfin ceux sous alimentation en FLM. Il est conclu que les farines des feuilles de *Meliaazedarach* et les farines des feuilles de *Ficus spp.* sont des sources potentielles de protéine pour l'utilisation dans la formulation des rations alimentaires des chèvres laitières à la place des concentrés commerciaux coûteux.

Mots clés: petits en pleine croissance, taux de croissance, chèvres en lactation, production laitière, supplémentation, gain de poids

Background

Most of the introduced dairy goats in Tanzania are kept by smallholder farmers under zero grazing system in raised slated houses. The animals are usually fed on natural pastures, crop residues and trees and shrubs obtained from farm boundaries, backyard and nearby conserved hills using cut and carry system. The natural pastures which form a large part of goat feeds are low in protein content and digestible nutrients, particularly during the dry season (Ondiek *et al.*, 2000). A study by Rubanza *et al.* (2003) reported that in order to improve ruminant nutrition and

production in the tropics, supplementation with protein and energy rich feeds is important. Unfortunately, commercial concentrates are not available or are too expensive for small holder farmers (Ondiek *et al.*, 2000), hence are rarely used in goats feeding (Kanani (2009). Ruminant supplementation using leguminous browse fodders is an alternative cheap source of locally available protein supplements (Rubanza *et al.*, 2003). Utilisation of leguminous tree and shrub leaves were reported to improve animal performance (Yahaya *et al.*, 2000). The practice of feeding goats with these non-conventional protein supplements is increasing among smallholder farmers as they provide least cost rations (Rai and Barman, 2004). However, information on the nutritive value of indigenous leguminous tree and shrub leaves in Tanzania is still scanty, hence, the need for this study. This study was therefore conducted to evaluate the suitability of two locally available leguminous trees in the study area (Kongwa district, Tanzania) as sources of protein in supplementary diets of lactating and growing dairy goats kept by small-scale farmers.

Literature Summary

Goats play a vital role in providing livelihood to smallholder and poor farmers living under harsh environmental conditions (Sarwar *et al.*, 2002), especially in combating malnutrition in the households (Haenlein, 2003). However, goat productivity is severely reduced due to depletion of feed resources in natural ranges. On the other hand, stall fed goats mostly depend on low quality diets based on crop residues and range hay (Khan, *et al.* 2009). Appropriate concentrate supplementation could tremendously improve the productivity of goats in such environments. However, in practice concentrate supplementation technologies have not been readily adopted by livestock farmers because of their high costs and irregular supply. Shrubs and trees remain the dominant fodder species and are best utilised by goats (Silanikove, 2000). Studies have shown that the use of tree and shrub forages as supplements to different basal diets lead to improved ruminant livestock performance in terms of milk production, growth rate and reproductive efficiency (Ondiek *et al.*, 2000).

Study Description

The present study was conducted at Kongwa district, Dodoma Region, Tanzania.. The district lies 6.2° South and 36.4° East, stretching between 900 and 1000 meters above sea level. Rainfall ranges from 500 to 800 mm per annum.

Two feeding trials were conducted to study the nutritive value of the locally available feed resources in four villages of Kongwa District. In the first trial, twenty-four lactating dairy goats (17 – 51 kg initial body weight) were randomly allotted into four dietary treatments. Treatment one involved farmers feeding practices. Treatment two, three and four involved supplementation with concentrate diets based on sunflower seed cakes (SFSC), *Melia azedarach* leaf meal (MLM) and *Ficus spp* leaf meal (FLM), respectively, as protein sources. In the second trial 32 growing kids (16 females and 16 males, aged 1 – 3 months, 4 – 14.5 kg initial body weight), were randomly allotted into the four dietary treatments mentioned above. Hay (*Cenchrus ciliaris*) was provided *ad libitum* as basal ration. All animals were provided with *ad-lib* amount of water for the whole experimental period of 90 days. Each experimental animal was supplemented with 30 g/kg $W^{0.75}$ (on as fed basis) of the concentrate diet (MML, FLM or SFSC). The composition of the supplementary diets used in the study are given in Table 1.

Table 1. Composition of the supplementary diets used in the study.

Parameter	Concentrate diets ^a		
	SFSC	MLM	FLM
Sunflower seed cake	20%	-	-
<i>Melia azedarach</i> leaf meal	-	30%	-
<i>Ficus spp.</i> leaf meal	-	-	48%
Hominy Meal	78%	68%	50%
Mineral lick	1.5%	1.5%	1.5%
Common salt	0.5%	0.5%	0.5%

^a concentrate diets based on sunflower seed cake (SFSC), *Melia azedarach* leaf meal (MLM) and *Ficus spp.*(leaf meal (FLM) as sources of protein.

Research Application

Dairy goats keepers in semi arid areas of Kongwa district have been constrained by a challenge of lack of feeds for supplementing their animals with protein and energy rich feeds. This study investigated the possibility of formulating good quality and least cost rations using locally available feed resources as supplementary diets for dairy goats kept in rural areas. The results in Table 2 show that milk production levels, growth rate and weight gain of the goats under the control diet (farmers' feeding practice) were significantly ($P \leq 0.001$) lower than that of the animals supplemented with SFSC, MLM and FLM. Among the supplementary diets, supplementation of SFSC produced the highest milk yield (339.33 litre), weight gain (10.30 kg) and growth rate (114.43 g/d) and was followed by MLM.

Table 2. Effects of supplementation of diets containing SFSC, MLM, FLM on milk production and growth performance of dairy goats in Kongwa District.

Variable	Diets			
	Control	FLM	MLMC	SFSC
Average daily milk yield in month 1 (l/d)	1.43 ± 0.28 ^c	2.65 ± 0.29 ^b	2.89 ± 0.36 ^a	2.84 ± 0.32 ^a
Average daily milk yield month in 2 (l/d)	1.68 ± 0.15 ^c	3.20 ± 0.16 ^b	3.58 ± 0.20 ^{ab}	3.86 ± 0.18 ^a
Average daily milk yield in month 3 (l/d)	1.25 ± 0.21 ^c	3.48 ± 0.22 ^b	3.69 ± 0.27 ^b	4.61 ± 0.24 ^a
Mean total milk yield for 90 days (l)	130.81 ± 16.05 ^c	279.98 ± 16.84 ^b	304.50 ± 21.04 ^{ab}	339.33 ± 18.61 ^{ab}
Average daily weight gain g/d	59.09 ± 3.57 ^d	82.39 ± 3.37 ^c	96.87 ± 3.34 ^b	114.43 ± 3.53 ^a
Mean weight gain for 90 days, kg	5.52 ± 0.32 ^d	7.42 ± 0.30 ^c	8.72 ± 0.30 ^b	10.30 ± 0.32 ^a

^{a,b,c,d}Means with different superscript letters within a row are significantly different (P<0.05).

Animals supplemented with a diet containing FLM had significantly (P<0.05) lower milk yield (279.98 litre), weight gain (7.42 kg) and growth rate (82.39 g/d) than the animals on SFSC diet. Concentrates based on *Melia azedarach* leaf meals as source of protein can be used in place of sunflower seed cake, thus reducing the costs of buying expensive commercial concentrates.

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References

- Haenlein, G.F.W. 2003. Goat milk in human nutrition. *Small Ruminant Research* 51:155 - 63.
- Kanani, J. 2009. Goat Production in Central and Eastern Africa, Proceedings of the 24th Annual Goat Field Day, Langston University.
- Khan, N.A, Habib, G and Ullah, G. 2009. Chemical composition, rumen degradability, protein utilisation and lactation response to selected tree leaves as substitute of cottonseed cake in the diet of dairy goats. *Animal Feed Science and Technology* 154:160 -168.
- Ondiek, J.O., Tuitek, J.K., Abdulrazak, S.A., Bareeba, F.B. and Fujihara, T. 2000. Use of *Leucaena leucocephala* and *Gliricidia sepium* as nitrogen sources in supplementary concentrates of dairy goats offered Rhodes grass hay. *Asian-Aust. Journal of Animal Science* 13:1249 -1254.
- Rai, S. N. and Barman, K. 2004. New Animal Feed Resources: Problems and Potential. pp. 1-14 In: Rai, S.N. and Sehgal, J.P. (Eds.). Proceedings of 11th Animal Nutrition Conference on Nutritional technologies for commercialisation of animal

- production systems.5-7 January 2004. J.N.K.V.V., Jabalpur (MP), India.
- Rubanza, C.D., Shem, M.N., Otsyina, R., Ichinohe, T. and Fujihara, T. 2003. Nutritive evaluation of some browse tree legume foliages native to semi arid areas in western Tanzania. *Asian-Aust Journal of Animal Science* 10:1429 - 1439.
- Sarwar, M., Khan, M.A., Iqbal, Z. 2002. Feed resources for livestock in Pakistan. *Int. J. Agric. Biol.* 4:186-192.
- Silanikove, N. 2000. The physiological basis of adaptation in goats to harsh environments. *Small Rumin. Res.* 35:181-193.
- Yahaya, M.S., Takahashi, J., Matsuoka, S., Kibon, A. and Dibal, D.B. 2000. Evaluation of arid region browse species from north eastern Nigeria using pen fed goats. *Small Ruminants Res.* 38:83 - 86.