Tropical Grasslands – Forrajes Tropicales (2014) Volume 2, 108−110

Pelletized forage-based rations as alternative feeds for improving goat productivity

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Keywords: Pellets, *Leucaena*, liveweight gains, milk production, Philippines.

Introduction

Goat farming is very popular in the Philippines, as it is considered by many to be a viable rural enterprise. However, the goat industry is faced with many challenges, including high pre-weaning mortality, poor nutrition and lack of strategic approaches to accelerate genetic improvement. The long-term rate of increase in goat numbers is only 0.97% per annum, due to high offtake rates and low productivity, and interventions are needed to accelerate growth of the population. The Philippine goat population was 3.88 M in 2010 and is expected to reach only 4.27 M by 2020 (compared with the target of 6.2 M) (Alo 2012).

Goats are typically fed on locally available resources, which are characterized by low quality and highly variable availability. These constraints can be overcome through processing techniques such as sun-drying and pelleting to ensure year-round feed supply. Pelleting offers particular advantages. Feeding animals with pellets provides better feed efficiency, greater starch digestibility, less feed waste, non-selective feeding, better handling and storage, and increased income due to more efficient feeding and higher productivity. The aim of this study was to develop pelletized forage-based rations for goats and evaluate them for their technical and financial viability.

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Methods

The study was conducted at the Small Ruminant Center (SRC) of Central Luzon State University, Science City of Muñoz, Philippines. Leaves of the tree legume, *Leucaena leucocephala*, and Napier grass (*Pennisetum purpureum*) were harvested at about 35 days of age, shredded and sun-dried for 3−4 days to attain 80−85% DM. These were ground to pass through 1 mm screen mesh using a hammer mill to produce leaf meals, which were mixed in different proportions (Table 1), and combined with protein, energy and mineral supplements to form 2 rations: for growing goats (PRG); and lactating goats (PRL). The meals were moistened to attain the desired binding effects, and pelletized using a machine designed and fabricated for this purpose. The pellets were cylindrical (20−25 mm in length and 8 mm in diameter).

To evaluate PRG, a total of 16 Anglo-Nubian crosses with mean body weight (BW) of 12.46 kg were used in a 120-day feeding trial. The animals were kept in individual pens and divided into 2 groups: 6 animals in the Control 1 group (forage + 120 g concentrate); and 10 animals in the PRG. In the middle of the feeding trial, 3 animals were randomly selected from each group to determine digestibility of the PRG. Voluntary DM intake and fecal output were measured for 7 days.

To evaluate the feeding value of PRL, a 105-day feeding trial was conducted using 12 multiparous goats [6 Anglo-Nubian crosses and 6 Boer crosses with mean body weight (BW) of 32.65 kg]. For each breed type, 3 does were fed PRL + fresh Napier, while 3 does were fed with Control 2 diet, forage + 250 g concentrate mix.

The Control 1 and Control 2 diets represent the standard feed used at the Small Ruminant Center (SRC) for growing and lactating goats, respectively, and consisted of chopped *P. purpureum* and a mixture of fresh forage legume foliage: *Leucaena leucocephala*, *Gliricidia sepium* and *Desmodium cinereum* in equal proportions, plus concentrate mix.

About 10% representative samples of feed, orts and feces were collected, pooled and subjected to DM and crude protein (Kjeldahl method) analysis following the AOAC (1984) procedure. Neutral detergent fiber was analyzed following Goering and Van Soest (1970) method.

Feed intake, BW, milk yield and nutrient digestibility data were subjected to ANOVA using the General Linear Model procedure of Statistica for Windows, Version 8. Partial budget analysis was conducted to determine the financial benefits of feeding PRG and PRL pellets versus the control diets.

Results and Discussion

Growing goats fed PRG had higher consumption and nutrient digestibility than those fed Control 1, resulting in bigger and heavier animals (22.35 vs. 19.74 kg) (Table 2). Aside from the higher BW, animals fed PRG had a better feed conversion efficiency (7.44 vs. 9.66 kg DM intake/kg bodyweight gain).

Lactating goats fed PRL had DM intakes and milk yields comparable with those fed with Control 2 diet (Table 3). DM intake was >3% of BW, indicating that normal consumption was achieved. This suggests that PRL could be a viable feeding option for lactating does. Feeding pellets is a labor-reducing and productivity-increasing technology.

Table 1. Composition (%) of feed rations for growing (PRG) and lactating (PRL) goats. Rations contained the nutrient requirements for growing and lactating goats (Kearl 1982).

	Growing Goats		Lactating Goats	
	Control 1	Pelletized ration (PRG)	Control 2	Pelletized ration (PRL)
P. purpureum	60	10	50	-
Fresh legumes	30	-	30	-
Leucaena leaf meal	-	35	-	45
Concentrate mix	10	-	20	-
Rice bran (D_1)	-	42	-	42
Copra meal	-	3	-	3
Molasses	-	7	-	7
Dicalcium PO_4	-	2	-	2
Common salt	-	1	-	1

Partial budget analysis showed a net gain of ₱242.93/growing goat and ₱825.93/doe in comparison with the control ration-fed animals. The pelletized rations are an acceptable feeding option, as goat raisers are willing to buy pellets and pay a small premium for quality.

Table 2. DM intake, final weight, average daily gain (ADG) and feed conversion efficiency of growing goats fed with Control 1 and a pelleted ration (PRG).

	Control 1	PRG	Significance
Daily DM intake (kg)	0.574	0.688	*
Final weight (kg)	19.74	22.07	*
ADG (kg)	0.061	0.079	*
Feed conversion efficiency (kg DM/kg gain)	9.66	7.44	*
DM digestibility (%)	70.96	68.42	ns
CP digestibility (%)	65.13	80.04	**
NDF digestibility (%)	52.42	74.21	**

Table 3. Average daily DM intake and milk yield of Anglo-Nubian and Boer cross goats fed with Control 2 and a pelleted ration (PRL).

	Breed type	Control 2	PRL	s.e.m.
DM intake (kg/d)	Anglo-Nubian	1.10	1.08	0.09
	Boer	1.11	1.05	0.10
Milk production (mL/d)	Anglo-Nubian	527. 7	587.3	2.00
	Boer	464. 7	475.3	1.93

Conclusion

The results of the feeding trials and financial analysis indicated the high potential of forage-based pelletized rations as alternative feeds for productive and sustainable goat farming enterprises.

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Orden EA; Cruz EM; Espino AN; Battad ZM; Reyes RG; Orden MEM; Frias NO; Gibe G; del Rosario NA; Villar EC. 2014. Pelletized forage-based rations as alternative feeds for improving goat productivity. Tropical Grasslands – Forrajes Tropicales 2:108–110.
DOI: 10.17138/TGFT(2)108-110

This paper was presented at the 22nd International Grassland Congress, Sydney, Australia, 15−19 September 2013. Its publication in *Tropical Grasslands – Forrajes Tropicales* is the result of a co-publication agreement with the IGC Continuing Committee. Except for adjustments to the journal's style and format, the text is essentially the same as that published in: **Michalk LD; Millar GD; Badgery WB; Broadfoot KM, eds. 2013. Revitalising Grasslands to Sustain our Communities. Proceedings of the 22nd International Grassland Congress, Sydney, Australia, 2013. New South Wales Department of Primary Industries, Orange, NSW, Australia. p. 788–789.**