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

EA Orden [A], EM Cruz [A], AN Espino [A], ZM Battad [B], RG Reyes [A], MEM Orden [A], NO Frias [A], AG Gibe [C], NA Del Rosario [A] and EC Villar [D]

[A] Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines
[B] Pampanga Agricultural College, Magalang, Pampanga, Philippines, http://www.pac.edu.ph/
[C] PhilMECH, Science City of Muñoz, Nueva Ecija, Philippines, http://www.philmech.gov.ph/
[D] Philippines Council for Agriculture & Aquatic Resources Research & Development, Los Baños, Laguna, Philippines http://www.pcaarrd.dost.gov.ph/
Contact email: eaorden@yahoo.com

Keywords: Pellets, *Leucaena*, forage, goats.

Introduction

Goat farming is very popular in the Philippines as it is considered by many to be a viable rural enterprise. Despite this, the goat industry is faced with many challenges, including problems relating to high pre-weaning mortality, poor nutrition and lack of strategic approaches to accelerate genetic improvement. The long term rate of increase of goat numbers is only 0.97% per annum, due to high offtake rates and low productivity. Thus, the Philippine goat population is only expected to reach 4.27million by 2020 (compared with the target of 6.2 million), given the 3.88million population in 2010 (Alo 2012). Interventions are needed to accelerate growth of the goat population. Goats are typically fed on locally available resources which are characterised by low quality and highly variable availability. These characteristics 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. While pellets are available for swine, poultry and buffalo in the Philippine market, pellets for goats are not currently available. The aim of this study was to develop pelletized forage-based rations for goats and evaluate them for their technical and financial viability.

Methods

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. The compositions of the experimental rations are shown in Table 1.

The two rations (PRG and PRL) were mixed and moistened to attain desired binding effects. These were pelletized using a machine designed and fabricated for this purpose. The pellets are 20-25 mm in length and 8 mm in diameter.

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

Ingredients	Growing Goats		Lactating Goats	
	Control1	Pelletized Ration (PRG)	Control2	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

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 two groups; 6 animals in the Control1 group (silage +120 g concentrate) and 10 animals in the PRG. In the middle of the feeding trial, three animals were randomly selected from each group to determine digestibility of the PRG. Voluntary DM intake and fecal output for 7days were collected.

To evaluate 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 Control2 diet, forage + 250 g 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 were subjected to ANOVA using the General Linear Model

Table 2. DM intake, final wt and ADG and feed conversion efficiency of upgraded goats fed with Control and PRG. SEM = Standard Error of Mean; ns *P* > 0.05; * *P* < 0.05; ** *P* < 0.01.

	Control1	PRG	SEM	Level of Sig.
Daily DM intake (kg)	0.574	0.688	0.018	*
Final weight (kg)	19.74	22.07	0.550	*
Ave. daily gain (kg)	0.061	0.079	0.005	*
Feed conversion efficiency (kg DM/kg gain)	9.66	7.44	0.380	*
DM digestibility (%)	70.96	68.42	2.868	ns
CP digestibility (%)	65.13	80.04	4.688	**
NDF digestibility (%)	52.42	74.21	6.747	**

Table 3. Average daily DM intake and milk yield of Anglo Nubian and Boer crosses fed with Control and PRL. SEM = Standard Error of Mean. There were no significant differences.

		Control2	PRL	SEM
Anglo-Nubian	DM Intake, kg	1.10	1.08	0.09
	Milk Production, ml	527.67	587.27	2.00
Boer	DM Intake, kg	1.11	1.05	0.10
	Milk Production, ml	464.67	475.29	1.93

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

Growing goats fed PRG had higher consumption and nutrient digestibility than those fed Control1. PRG produced bigger and heavier animals (Table 2). The ADG of 79 g for PRG fed goats resulted in a final weight of 22.35 kg which is higher than the 19.74 kg in the $Control_1$. Aside from the higher BW, animals fed PRG required only 7.44 kg DM to produce a kg gain, which is 2.22 kg lower (*P*<0.05) than the 9.66 in the Control1. The incorporation of processed *Leucaena* and napier reduced particle size that increased rumen outflow rate (Orden, *et al*. 2000) of the forage components of the PRG. The breakdown of PRG's fiber components and the presence of more degradable CP resulted in higher DM intake of goats fed with PRG.

Lactating goats fed PRL had DM intake and milk yield comparable with those fed with Control2 diet (Table 3). DM intake was > 3% of BW, indicating that normal consumption was achieved. This result suggests that PRL could be a viable feeding option for lactating does whether of Boer or Anglo-Nubian bloodline. Feeding pellets is a labor-reducing and productivity increasing technology.

Partial budget analysis showed a net gain of ₱242.93/growing goat and ₱825.93/doe. These pelletized rations are an acceptable feeding option as goat raisers are willing to buy pellets and pay a small premium for quality.

Conclusion

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

References

Alo AMP (2012) Goat Industry Science and Technology Plans and Potential Outcomes. PCARRD, Los Baños, Laguna.

OAC. (1984) Official Methods of Analysis, 13'h Ed. Association of Official Analytical Chemists. Washington D.C.

Goering HK, Van Soest PJ (1970) Forage Fiber Analysis. United States Dept. of Agric. Hand Book No. 379.

Kearl AJ (1982) Nutrient Requirement of Farm Animals. Reston, Virginia, Reston Publishing Company, Inc.

Orden EA, Yamaki K, Cruz EM, Orden MEM, Abdulrazak SA, Ichinohe T, Fujihara T (2000) *L. leucocephala* and *G. sepium* supplementation in sheep fed with ammonia treated rice straw: Effects on intake, digestibility, microbial protein yield and live-weight changes. *Asian-Australasian Journal of Animal Science* **13**(12), 1659-1666.