A COMPARISON OF FEED INTAKE AND GROWTH PERFORMANCE OF GOATS FED GUINEA GRASS AND NAPIER GRASS

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ABSTRACT. In Malaysia, Guinea grass (*Megathrysus maximus*) and Napier grass (*Pennisetum purpureum*) are considered as good palatable fodder for goats and have been used widely. The objective of this study is to evaluate the potential grasses for goats to have optimum growth performance and optimum feeding cost. Fourteen male Jamnapari goats with an average age of five months were used in this experiment. All animals were individually weighed and divided equally (seven goats) into two treatment groups. Group 1 was fed with cut and carry Guinea grass while group 2 animals were fed cut and carry Napier grass, and both groups were given the same quality and quantity of PKC and molasses. There was no significant difference observed in the average final weight (AFW), average weight gain (AWG) and average daily gain (ADG) among the two dietary treatment group. However, dry matter intake (DMI) and feed conversion ratio (FCR) showed a significant difference. The group fed with Napier grass showed lower ADMI and FCR. From the viewpoint of economic evaluation, feeding Guinea grass and Napier grass as an animal feed is economincally viable for local farmers.

Keywords: Jamnapari goat, Guinea grass, Napier grass, feed intake, growth performance

INTRODUCTION

Forages are the single most important feed source for ruminants worldwide. Forage is a type of grass or legume used to feed animal in many different forms. It may be fed as pastures or fodder (cut and carry grass) or be conserved as hay, silage or haylage. Several types of forages can be used as pasture or fodder for feeding animals. Guinea grass (*Megathrysus maximus*) and Napier grass (*Pennisetum perpureum*) are common fodder grasses that have been used widely. (Wong et al., 1982). In Malaysia, Guinea grass and Napier grass are considered as good palatable fodder for goats along with other grasses (humidicola grass, centrosema, and glyricidia).

Guinea grass is native to tropical Africa. It is a major pan tropical grass used throughout the tropics for pasture, cut-and-carry, silage and hay. It is a fast growing and leafy grass, which is palatable to livestock with a good nutritional value. However, it is generally recommended to supplement it with sources of protein in order to meet

Figure 1. Napier grass

Figure 2. Guinea grass

nutritional requirements or improve animal performance. Guinea grass is an ideal forage plant as it grows well on wide variety of soils and even under light shade of trees and bushes and can survive long dry spells and quick-moving fires which does not harm the underground roots. Guinea grass can produce yields an average of 30 t DM/ha/year (Cook *et al.*, 2005). The yields depend on the cultivar and fertilizer application. For instance, unfertilized Guinea grass yields around 7 t DM/ha while N-fertilized pastures can yield up to 42 t/ha (Hongthong Phimmasan, 2005). For long-term maintenance of stand, it should not be cut or grazed below about 30 cm, and should be cut or grazed at about 4-weekly intervals to obtain best balance between quality and quantity.

Napier grass originated from sub-Saharan tropical Africa (Clayton *et al.*, 2013). It has been introduced as forage into most tropical and subtropical regions worldwide. It is a very versatile species that can be grown under a wide range of conditions and systems: dry or wet conditions, smallholder or larger scale agriculture. It is a valuable forage and very popular throughout the tropics, notably in cut-and-carry systems (Mannetje, 1992; FAO, 2015). Napier grass is a full sunlight species that can still produce under partial shade but does not withstand complete shade under a dense tree canopy (Francis, 2004). Napier grass is fast growing and has a high annual productivity that depends on the climatic conditions, especially temperature and rainfall (Aroeira *et al.*, 1999). Napier grass requires high levels of fertilizer and a regular water supply (Mannetje, 1992). Yields range from 20 to 80 t DM/ha/year under high fertilizer inputs (Francis, 2004; Skerman *et al.*, 1990).

With no, or inadequate, fertilizer, yields are in the range of 2-10 t DM/ha/year (Bogdan, 1977). Generally, the recommended age to harvest Napier grass is at 6 to 8 weeks of growth, to optimize the dry matter yield and nutritive value (Lounglawan *et al.*, 2004). The aim of this study was evaluated a potential grasses for goat to get an optimum growth performance and optimum feeding cost.

MATERIALS AND METHODS

Experimental Animals and Treatment Diets

The experiment was conducted at the Small Ruminant Unit, Malaysian Veterinary Institute, Kluang, Johor. Fourteen male Jamnapari goats with an average age of five months were used in this experiment. Animals were reared by an intensive system. All animals were individually weighed and divided equally (seven goats) into two treatment groups for the entire duration of the trial (120 days). Group 1 was fed with cut and carry Guinea grass while group 2 was fed cut and carry Napier grass whereby it was harvested at 4 and 7 weeks respectively. Both groups were given the same quality and quantity of PKC and molasses. Fodder, water and mineral licks were offered *ad libitum*.

Feeding Trial

The goats were fed with treatment diets for 14 days for the adaptation period before the start of data collection. The goats were fed twice a day around 9 a.m. and 3 p.m. Feed intake of goats was recorded daily and feed consumption was determined weekly to meet the daily requirement. Feeding troughs were always cleaned before a new feed is placed to ensure that the new feed was always clean and free of fungus. During the feeding trial, each goat was weighed twice a month, in the morning before feeding to calculate an average daily gain (ADG). The ADG was calculated by dividing the initial and final weight differences by the total number of experimental days (120 days).

Data Analysis

Feed intake and growth performance data were analysed by one-way analysis of variance (ANOVA) using the general linear model (GLM) programme of SAS (package version 9.3). Statistical significance of differences between group means was compared by Duncan post-hoc test. The level of significance used to determine the differences between treatments is $p<0.05$.

RESULTS AND DISCUSSION

Data of feed intake and growth performances of Jamnapari goat fed with Guinea grass (Group 1) and Napier grass (Group 2) that was recorded over the trial period are shown in Table 1. The results showed that goats in group 1 (fed Guinea grass) achieved higher average final weight gain (35.92 kg), average weight gain (15.50 kg) and average daily gain (0.130 g) than goats in group 2 (34.67 kg, 14.42 kg and 0.121 g respectively). However, there was no significant difference in these 3 parameters among the two dietary treatments group.

Table 1. Feed intake and growth performance of goats fed Guinea grass and Napier grass.

Parameter	Group 1 (Fed Guinea Grass)	Group 2 (Fed Napier Grass)
Avg. Initial Weight (AIW) (kg)	20.42[a]	20.25[a]
Avg. Final Weight (AFW) (kg)	35.92[a]	34.67[a]
Avg. Weight Gain (AWG) (kg)	15.50[a]	14.42[a]
Avg. Daily Gain (ADG) (kg/day)	0.130[a]	0.121[a]
Avg. Dry Matter Intake(DMI) (kg/day)	0.97[a]	0.80[b]
Feed Conversion Ratio (FCR)	7.46[a]	6.61[b]

Note: Means with same superscript letter in same row are not significantly different ($p>0.05$)

Table 2. Nutritive values of Guinea grass and Napier grass.

Parameter (%)	Guinea Grass	Napier Grass
Dry matter (DM)	13.5	16.6
Crude Protein,(CP)	17.0	12.8
Crude Fibre (CF)	40.8	46.9
Energy/ME (MJ/kg)	9.40	7.40

For average dry matter intake (ADMI) of goats, the results showed a significant different between groups. Terms of dry matter intake (DMI) generally expressed for feed intake or feed consumption. Feed intakes refers to the quantity of feed consumed by an animal or group of animals in a given period of time during which they have free access to that feed (Forbes, 2007). Animal production is largely dependent on daily rate of feed intake (Illius *et al.,* 2000). The goat fed with Guinea grass resulted in higher DMI (0.97 kg/day) because of nutritive value of a grass. Nutritive value of a given feedstuff is a function of its DMI and its ability to supply the nutrients required by an animal for maintenance, growth and reproduction (Teferedegne, 2000). Table 2 shows the nutritive values of Guinea grass and Napier grass that was fed for goats. Guinea grass has a high crude protein (CP) and energy (ME) even though the dry matter is not high compared to Napier grass. This finding was supported by Man and Wiktorsson (2003) studied that although dry matter content in Guinea grass is not high as Napier grass, its protein yield and dry matter intake are higher than Napier grass.

Feed conversion ratio (FCR) is one of the important parameters that was measured in growth performance of animal. FCR is a measure of how efficient the body of livestock convert animal feed to desired output. The desired output may be eggs, milk, meat and wool. FCR is the mass of feed eaten divided by the output over a given period of time. Based on Table 1, goats fed Napier grass showed lower FCR compared

Table 3. Feed cost of Guinea grass and Napier grass.

Group Treatment	Types of Feed	Feed Cost (RM/kg)	Feed given (kg/goat)	Feed Cost (RM)	Total Feed Cost (RM/goat/day)
Group 1	Guinea Grass	0.25	3.0	0.75	1.46
	PKC	0.90	0.30	0.27	
	Molasses	1.20	0.30	0.40	
Group 2	Napier Grass	0.30	3.0	0.90	1.61
	PKC	0.90	0.30	0.27	
	Molasses	1.20	0.30	0.36	

Notes: PKC=Palm Kernel Cake

to goats fed Guinea grass. Animals that have a low FCR are considered efficient users of feed. Farmers desire a low FCR because it means that more output is produced with less feed. Therefore, a low FCR means lower feed cost.

As for economic evaluation which was calculated based on the current animal feed prices (Table 3), showed that the costs for giving Guinea grass and Napier grass as an animal feed were RM1.46 and RM1.61 respectively. Cost of feeding Napier grass is 9.3% higher (RM0.15) than cost of feeding guinea grass. However, both costs are in the range of feeding cost that is RM1.20 to RM2.10 (cost was based on survey with a few goat farmers).

CONCLUSION

Feedings goats with Guinea grass and Napier grass showed no significant difference of the growth performance of goats. Feeding Napier grass produced optimum weight with low DMI and FCR than those fed with Guinea grass. Low FCR is needed in livestock production because it means that more output is produced with less feed. It is recommended to choose Napier grass as a potential grass to obtain an optimum growth performance and optimum feeding cost for their daily operational ranch. In addition, Napier grass provided a high annual productivity compared to guinea grass and it will be a better choice for farmers. Due to high feed costs, farmers in tropical regions are encouraged to use the naturally available fodders for livestock farming.

REFERENCES

1. Aroeira L.J.M., Lopes F.C.F., Deresz F., Verneque R.S., Dayrell M.S., de Matos L.L., Maldonado-Vasquez H. and Vittori A. (1999). Pasture availability and dry matter intake of lactating crossbred cows grazing elephant grass (*Pennisetum purpureum* Schum.). *Anim. Feed Sci. Technol.* **78(3-4):** 313-324
2. Clayton W.D., Govaerts R., Harman K.T., Williamson H. and Vorontsova M. (2013). *World checklist of Poaceae.* Richmond, UK: Royal Botanic Gardens, Kew.
3. Cook B.G.,Pengelly B.C., Brown S.D., Donnelly J.L., Eagles D.A., Franco M.A., Hanson J., Mullen B.F., Partridge I.J., Peters M. and Schultze-Kraft R. (2005). *Tropical Forages*. CSIRO, DPI&F(Qld), CIAT and ILRI, Brisbane, Australia.
4. FAO (2015). *Grassland Index. A searchable catalogue of grass and forage legumes.* FAO, Rome, Italy.
5. Forbes J.M. (2007). *Voluntary Food Intake and Diet Selection in Farm Animals,* 2nd edn. CAB International, Wallingford, UK.

6. Francis John K. (2004). *Pennisetum purpureum* Schumacher. In: *Wildland shrubs of the United States and its Territories: thamnic descriptions: volume 1*. Francis J.K. (ed.). Gen. Tech. Rep. IITF-GTR-26. USDA Forest Service, Int. Inst. Trop. Forestry. 830 pp
7. Hongthong Phimmasan (2005). *Evaluation of tropical forages as feeds for growing rabbits*. MSc thesis, Swedish University of Agricultural Sciences, Department of Animal Nutrition and Management, Uppsala, Sweden.
8. Llius A.W., Jessop N.S. and Gill M. (2000). Mathematical models of food intake and metabolism in ruminants. In: *Ruminant Physiology: Digestion, Metabolism, Growth and Reproduction.* CAB International, Wallingford, UK. pp 21-39.
9. Lounglawan P., Lounglawan W. and Suksombat W. (2014). Effect of cutting interval and cutting height on yield and chemical composition of King Napier grass (*Pennisetum purpureum* × *Pennisetum americanum*). *APCBEE Procedia.* **8:** 27-31.
10. Man N.V. and Wiktorsson H. (2003). Forage yield, nutritive value, feed intake and digestibility of three grass species as affected by harvest frequency. *Trop. Grassld.* **37:** 101-110)
11. Mannetje L.'t (1992). *Pennisetum purpureum* Schumach. *Record from Proseabase.* Mannetje L.'t and Jones R.M. (Eds). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia
12. Skerman P.J. and Riveros F. (1990). *Tropical grasses. FAO Plant Production and Protection Series No. 23*. FAO, Rome
13. Teferedegne B. (2000). New perspectives on the use of tropical plants to improve ruminant nutrition. *Proceedings of the Nutrition Society.* **59:** 209-214.
14. Wong C.C., Chen C.P. and Ajit S.S. (1982). *A report on pasture and fodder introductions in Peninsular Malaysia.* MARM Rpt. 76.

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