INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2004/06–1–143–148
http://www.ijab.org

Nutritive Value of Batiki Grass (*Ischaemum aristatum* var. *indicum*) Supplemented with Leaves of Browses (*Gliricidia sepium* and *Leucaena leucocephala*) on Performance of Goats

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ABSTRACT

Two experiments were carried out to test the nutritive value of Batiki grass (*Ischaemum aristatum* var. *indicum*) supplemented with either *Gliricidia sepium* or *Leucaena leucocephala* at different levels. Sixteen growing goats (Anglo-Nubian x Local Fiji) were used to measure voluntary feed intake, apparent nutrient digestibility and to estimate live-weight changes. At the start of experiments 1 and 2, the mean age and live weight of goats were 8-10 months and 8.7 ± 0.34 kg, and 10 - 12 months' and 12.3 ± 0.11 kg, respectively. In both experiments, there were four treatments and Batiki grass alone control. Three amounts of Gliricidia (experiment 1) and Leucaena (experiment 2), respectively were offered: 0, 20%, 50% and 80% of the total daily forage allowance. The basal and supplemental components of the diets were mixed and offered as a whole diet. *Leucaena* had higher CP but lower DM NDF compared to Gliricidia. In the two experiments, Batiki grass had similar, DM, CP, ash and GE, but had a higher NDF (39.7 v. 34.5%) content in experiment 1. DM and NDF contents of the diets decreased with incremental levels of supplementation of Batiki grass with either Gliricidia or Leucaena. CP content of diets increased with incremental levels of supplementation with either of the browses. Leucaena diets were higher in CP than those of Gliricidia. GE (MJ/kg DM) content of diets also increased with increase in the levels of supplementation with both Gliricidia and Leucaena. The intake of Batiki grass by goats in both experiments differed significantly ($P<0.05$). Voluntary feed intake increased ($P<0.05$) with incremental levels of supplementation of Batiki with either Gliricidia or Leucaena. In both experiments, incremental levels of supplementation with either of the browses increased daily live-weight gain ($P<0.05$). However, live-weight gains were relatively higher ($P<0.05$) with Leucaena diets than with Gliricidia. Feed efficiency (feed/gain) of goats in both experiments followed the trend of live-weight gain and voluntary feed intake ($P<0.05$). Supplementation of Batiki grass with either Gliricidia or Leucaena increased the digestibility of DM, CP, OM and NDF by the growing goats. However, there was a decline in growth rate but not voluntary feed intake at the + 80 Gli and + 80 Leu diets. Data on growth rate and apparent nutrient digestibility coefficients suggest that both browses are potential sources of protein in ruminants' diets, however, Leucaena had advantages over Gliricidia in all parameters measured. In conclusion, the best level at which either Gliricidia or Leucaena could be used to supplement Batiki grass to obtain maximum growth of crossbred Anglo-Nubian goats in Samoa would be at + 50 Gli and + 50 Leu, respectively.

Key Words: Batiki grass; *Gliricidia; Leucaena*; Feed intake; Growth; Nutrient Digestibility; Goats

INTRODUCTION

Batiki grass (*Ischaemum aristatum* var. *indicum*) is the most common propagated pasture grass specie for ruminant livestock in Samoa and other small Pacific island countries. It can tolerate heavy grazing and poor management. Due to its competitive nature, it is difficult to use in legume-grass mixtures (Pottier, 1983). The challenge in using pasture as a sole source of forage for animals is determining whether or not the pasture can supply adequate nutrients for maintenance, growth and production. In comparison with other grass species such as guinea, signal and elephant grasses, it has low nutritive value (Aregheore, 2001).

In the Pacific Island countries (PICs) a number of indigenous and introduced browse species abounds. The leaves of browses are potential sources of nutrients. They are therefore used to improve the production of ruminant livestock consuming tropical pastures that have low nutritive value and at present form an integral part of ruminant feeding systems (Brewbaker, 1986; Preston & Murgeito, 1987; Yahaya *et al.*, 2001). The importance of browses in the nutrition of ruminant livestock in the tropics and subtropics has been stressed (Mandal, 1997; Kaitho *et al.*, 1998).

The efficiency of ruminant livestock production especially during adverse weather conditions (drought/dry season) is dependent upon the use of available feed for maintenance, growth and reproduction. Today a wide variety of browse species are used in livestock production in the tropics and temperate countries of the world.

It has been emphasized that most tropical grass species have low dry matter digestibility and intake (Minson, 1971). Livestock reared on Batiki alone have problems in meeting their maintenance need (Aregheore, 2001), therefore, it is imperative to balance their diet in terms of protein, vitamins and minerals through supplementation with leaves of browse trees. The leaves, shoots and twigs of browse species can help overcome the nutritional constraints of low quality feeds (roughage). It has been reported that leaves from browse and fodder trees form a major part of livestock feed in tropical countries (Mandal, 1997), and they play an important role in improving dietary protein (Kaitho *et al*., 1998). It is the objective of these experiments to test the effectiveness of either *Gliricidia sepium* or *Leucaena leucocephala* as supplements to a basal diet of Batiki grass on voluntary feed intake, growth rate and nutrient utilization by growing goats in Samoa.

MATERIALS AND METHODS

Experimental site. Two experiments were conducted at the Goat Unit, School of Agriculture, The University of the South Pacific, Alafua Campus, Apia, Samoa (Latitude ≈ 3.5^0 S, Longitude ≈172.5^0 W). Experiment 1 was conducted between November 4 and December 24, 2000, while experiment 2 was between December 31, 2000 and February 19, 2001.

Animals. Sixteen growing goats (Anglo-Nubian x Local Fiji) were used to measure the voluntary feed intake, apparent nutrient digestibility and to estimate live-weight changes. At the start of experiments 1 and 2, the mean age and live weight of the goats were 8-10 months and 8.7 ± 0.34 kg, and 10 - 12 months' and 12.3± 0.11 kg, respectively. Before the commencement of the experiments the goats were drenched with an anthelminthic (Albendazole, Smithkline Animal health Products, Auckland, New Zealand) at a rate of 1 mL/10 kg bodyweight. The animals were weighed at the beginning and end of each experiment. Each experiment lasted for 51 days.

Diets, feeding and management. Batiki grass was harvested daily. This was chopped with a bush knife into pieces (6-8 mm) to limit preferential selection of forage components. *Gliricidia* and *Leucaena* were harvested in the morning for feeding in the afternoon, with some allowed to wilt overnight for feeding in the morning. Stems were removed from both forages to ensure that the fodder composition was uniform. In both experiments, there were four treatments and Batiki grass offered alone was used as control. Three amounts of *Gliricidia* (experiment 1) and *Leucaena* (experiment 2), respectively were offered: 0, 20, 50 and 80% of the total daily forage allowance. The basal and supplemental components of the diets were mixed and offered as a whole diet. The levels of supplementation were calculated as percentage of total *ad libitum* daily forage allowance.

Experimental procedure and design. An adaptation period of seven days was allowed to the goats to get used to the experimental diets. The four diets were offered in a randomized complete block design to the 16 goats, i.e. four goats per treatment, measurements for 51 days. The diets were fed on an *ad libitum* basis to allow about 10 – 20% refusal. These were offered three to four times daily to ensure constant availability. Batiki grass, Gliricidia and Leucaena were sampled once a week for dry matter determination. Feeds offered and refused were recorded on a daily basis to estimate voluntary dry matter intake. The live weights recorded at the end of each week of the experiment were used to calculate the amount of the mixtures to be offered during the subsequent week.

All the goats were allowed free access to mineral/vitamin block and ample drinking water was provided daily. The mineral/vitamin block contained salt, calcium, magnesium, copper, cobalt, iodine, phosphorus, manganese, iron, zinc, selenium, Vit. A, D and E, with copra meal and molasses added (Summit). At early morning, feeding refusals of previous day's feed was weighed and sampled. Cleaning of the pens and removal of leftovers from the previous day was done daily before supplying each day's diet.

Digestibility study. At the end of each growth phase, all animals in each diet group were used for metabolic studies. Since animals were on the same diet and environment, digestibility study started two days at the end of the growth phase. The total faecal collection method was used for faeces. The total daily faecal output for each animal was weighed before a 25% sample was removed for dry matter determination. The faeces were later dried in a forced-air oven at 70^0C for 36 h. The daily samples of faeces and diets were then bulked separately and milled with a simple laboratory mill and stored in airtight bottles until required for analysis.

Analytical methods. The AOAC (1995) method was used for nutrient contents of diets. All analyses were done in triplicate. Dry matter was determined by drying at constant weight at 70^0C for 24 h in a forced-air oven, ash by incineration at 600^0C for 4 h, protein by the micro-Kjeldahl procedure (N x 6.25). Neutral detergent fibre (NDF) analysis was according to Goering and Van Soest (1970).

Statistical analysis. Data on voluntary feed intake, growth rate, feed efficiency and apparent nutrient digestibility coefficients were analyzed with ANOVA using individual goat as a replicate (Steel & Torrie, 1980). Where significant differences were observed treatment means were compared with Duncan's multiple range tests. Also, all within treatments data on growth, voluntary feed intake, feed efficiency and apparent nutrient digestibility coefficients between *Gliricidia* and *Leucaena* were subjected to a Student's *t*-test.

RESULTS

Chemical composition of feeds and experimental diets. All the goats remained healthy throughout the experimental periods. The chemical composition of the feeds used in the experiments is presented in Table I. The values given are the means of three observations. Among the two browses *Leucaena* forage had a higher crude protein (CP) but lower dry matter (DM) and neutral detergent fibre (NDF) compared to *Gliricidia* forage. In the two experiments, Batiki grass had similar, DM, CP, ash and gross energy, but had a higher NDF (39.7 v. 34.5%) content in experiment 1.

Table II presents the composition of diets offered to the goats in the two experiments. The DM and NDF contents of the diets decreased with incremental supplementation of Batiki grass with either *Gliricidia* or *Leucaena*. However, CP content of diets increased with incremental supplementation of Batiki grass with either *Gliricidia* or *Leucaena*. *Leucaena* diets were higher in CP than those of *Gliricidia*. OM content was within the same range for all diets in both experiments. The gross energy (MJ/kg DM) content of the diets was observed to increase with levels of supplementation of Batiki grass diets with either *Gliricidia* or *Leucaena*.

Voluntary feed intake, growth rate and feed efficiency. Table III presents data on voluntary feed intake, growth and feed efficiency of the goats in experiments 1 and 2. The intake of Batiki grass by the goats in both experiments differed significantly (P<0.05). The goats in experiment 2 had a higher level of Batiki grass intake compared to those in experiment 1. Voluntary feed intake was observed to increase (P<0.05) with incremental level of supplementation of Batiki grass with either *Gliricidia* or *Leucaena*. The source of forage protein and level of supplementation with either (*Gliricidia* or *Leucaena*) were observed to have effect on voluntary feed intake of the goats.

The goats in experiment 2, had significantly higher feed intake (P<0.05) compared to those in experiment 1. The *Leuceana* diets were accepted at the first presentation to the goats, unlike *Gliricidia* diets that were not initially accepted during the first few days. However, during the subsequent period of the experiment, *Gliricidia* diets offered to the goats were consumed at all levels of supplementation.

In both experiments, incremental supplementation of Batiki grass with either of the browses increased body weight gain and daily live-weight gain (P<0.05). Body weight and daily live-weight gains of goats with higher level of supplementation with either + 80 Gli and + 80 Leu were observed to decreased. However, daily live-weight gain of goats that received both diets was significantly higher (P<0.05) than those of goats that received Batiki grass as the sole diet (Table III). Live-weight gains were relatively higher (P<0.05) with those goats supplemented with *Leucaena* than those with *Gliricidia*. Feed efficiency (feed/gain) of the goats in both experiments followed the trend of live-weight gain and voluntary feed intake (P<0.05).

Apparent nutrient digestibility coefficients. Table IV presents the mean values with standard error for the mean effects of dietary treatments on apparent nutrient digestibility coefficients by goats offered Batiki grass

Table I. Chemical composition of the food used in experiments

	Nutrients (on dry matter basis)				
	DM (%)	Ash (%)	CP (%)	NDF (%)	GE (MJ/kg DM)
			Experiment 1		
Batiki grass	37.3	7.6	5.3	39.7	12.8
Gliricidia	27.1	7.8	18.6	26.4	14.4
			Experiment 2		
Batiki grass	34.9	7.6	5.2	34.5	12.4
Leucaena	23.0	6.8	24.6	22.5	15.2

DM, Dry matter; CP, Crude protein; NDF, Neutral detergent fibre; GE, Gross energy

Table II. Proximate chemical composition of diets offered (Batiki grass; different ratios of Batiki/*Gliricidia* and Batiki/*Leucaena* (% DM)

	Diets							
	Batiki/Gliricidia				Batiki/Leucaena			
Nutrients (%)	Batiki	+20 Gli	+50 Gli	+80 Gli	Batiki	+20 Leu	+50 Leu	+80 Leu
Dry matter (DM)%	37.3	35.4	32.6	30.8	34.9	32.5	31.4	30.2
Analysis of DM (%)								
Crude protein (%)	5.3	9.6	14.8	16.3	5.2	11.1	12.8	15.3
NDF (%)	39.7	35.8	36.3	33.8	34.5	32.8	30.6	28.8
Ash (%)	7.6	7.1	7.0	7.0	7.6	7.2	7.1	6.9
Organic matter (%)	92.4	92.9	93.0	93.0	92.4	92.8	92.9	93.1
Energy (MJ/kg DM)	12.8	14.7	14.9	15.8	12.4	13.8	14.5	14.8

+ Gli, with *Gliricidia*; + Leu, with *Leucaena;* NDF, Neutral detergent fibre supplemented with either *Gliricidia* or *Leucaena*. The goats on Batiki grass sole diet in experiment 1 had higher digestibility of DM and NDF compared to those in experiment 2. Organic matter (OM) and CP digestibility of Batiki grass by goats in experiment 2 were significantly better (P<0.05) compared to the digestibility of same nutrients by goats in experiment 1.

At all levels of supplementation the digestibility of nutrients (DM, OM, CP and NDF) by goats in experiment 2 (*Leucaena* diets) were significantly higher (P<0.05) than those in experiment 1 (*Gliricidia* diets). It was observed that incremental supplementation with either *Gliricidia* or *Leucaena* increased digestibility of DM, OM, CP and NDF (P<0.05). In both experiments apparent nutrient digestibility coefficients were remarkably better when Batiki grass was supplemented with the browse species (*Gliricidia* or *Leucaena*) compared to the Batiki sole diets. However, *Leucaena* diets were better digested than those of *Gliricidia* by the goats (Table IV).

Table III. Voluntary feed intake, live weight gain and feed efficiency of goats offered Batiki grass; and different ratios of Batiki/*Gliricidia* and Batiki/*Leucaena* (% DM)

	Diets			
Experiment 1 (*Gliricidia*)				
Parameters	**Batiki**	**+ 20 Gli**	**+ 50 Gli**	**+ 80 Gli**
Initial live weight (kg)	8.4	8.6	9.3	8.6
Final live weight (kg)	11.1	12.2	13.1	11.8
Body weight gain (kg)	2.7	3.6	3.8	3.2
Daily gain (g)	53^{bc1}	71^{a1}	75^{a1}	63^{ab1}
Daily feed intake (g)	300^{bc1}	309^{ab1}	309^{ab1}	313^{a1}
Dry matter intake (g/kg$^{0.75}$/day)	49.34	47.32	44.85	49.14
Daily protein (N x 6.25) intake (g/kg $^{0.75}$/day)	2.62	4.54	6.64	8.01
Feed efficiency (Feed/gain)	5.7	4.4	4.1	5.0^{1}
Experiment 2 (*Leucaena*)				
Parameters	**Batiki**	**+ 20 Leu**	**+ 50 Leu**	**+ 80 Leu**
Initial live weight (kg)	12.5	12.3	12.3	12.2
Final live weight (kg)	15.4	16.7	16.9	15.5
Body weight gain	2.9	4.4	4.6	3.3
Daily gain (g)	57^{c}	86^{a2}	90^{a2}	68^{bc2}
Daily feed intake (g)	320^{c2}	418^{ab2}	424^{a2}	430^{a2}
Dry matter intake (g/kg$^{0.75}$/day)	41.18	50.61	50.84	55.06
Daily protein (N x 6.25) intake (g/kg$^{0.75}$/day)	2.14	5.62	6.51	8.42
Feed efficiency (Feed/gain)	5.6	4.4	4.5	6.3

+ Gli, - *Gliricidia*; + Leu, - *Leucaena*; [a,b,c,d] Means within rows with different superscript differ (P<0.05); [1, 2] Means within each treatment for each variable of different superscripts differ (P<0.05).

Table IV. Apparent nutrient digestibility coefficients of goats offered batiki grass; and different ratios of Batiki/*Gliricidia* and Batiki/*Leucaena*

	Diets			
Experiment 1 (*Gliricidia*)				
Nutrients (%)	**Batiki**	**+20 Gli**	**+50 Gli**	**+80 Gli**
Dry matter	52.5^{a}	67.3^{ab}	66.8^{ab}	53.4^{b1}
Organic matter	55.6^{b2}	68.2^{a}	68.6^{a}	58.2^{ab1}
Crude protein	43.4^{c}	67.1^{a}	65.9^{a}	52.8^{b}
Neutral detergent fibre	56.0^{a}	58.8^{a1}	52.4^{b1}	62.8^{a1}
Experiment 2 (*Leucaena*)				
Nutrients (%)	**Batiki**	**+20 Leu**	**+50 Leu**	**+80 Leu**
Dry matter	58.3^{c}	69.4^{ab}	70.2^{a}	69.8^{ab2}
Organic matter	64.5^{b2}	72.6^{a}	74.2^{a}	68.3^{b2}
Crude protein	45.4^{b}	64.8^{a1}	66.7^{a}	61.1^{a}
Neutral detergent fibre	62.0^{b}	64.3^{b2}	68.3^{ab2}	73.5^{a2}

+ Gli,- Gliricidia; + Leu, - Leucaena; [a,b,c] Means within rows with different superscript differ (P<0.05); [1, 2] Means within each treatment for each variable of different superscripts differ (P<0.05)

DISCUSSION

Chemical composition of feeds and experimental diets. The effects of supplementation on nutritive value of Batiki grass, with either *Gliricidia* or *Leucaena* on the performance of growing goats are reported in two experiments. The comparison between the two browses is also made to facilitate discussion. DM, OM and NDF of Batiki grass used in both experiments were similar to values reported by Solomona (1988). However, the CP value of Batiki grass reported here is lower than the values reported earlier by Solomona (1988) and Aregheore (2001). The period of the year, forage age and maturity stage may be implicated for the differences observed in the CP content of Batiki grass.

The DM and NDF contents of Batiki grass used in experiment 2 were lower than that of Batiki grass used in experiment 1. The browses had low DM and NDF compared with the Batiki grass. The CP, OM and NDF content of *Gliricidia* and *Leucaena* reported here are within the range reported in the literature (Smith *et al*., 1995; Rootheart & Paterson, 1997; Kaitho *et al*., 1998).

Gliricidia had lower CP, but a higher NDF content than *Leucaena* in the experiments reported and this observation support the reports of Orden *et al*. (2000) with *Gliricidia* than *Leucaena* when both browses were used to supplement sheep fed with ammonia treated rice straw in Japan. But contradicts the reports of Reed *et al*. (1990), Richards *et al*. (1994) and Abdulrazak *et al*. (1996) who reported lower fibre components for *Gliricidia*.

The improvements observed in nutrient contents of Batiki grass with incremental levels of supplementation with either *Gliricidia* or *Leucaena* seems a common characteristics among grass species when supplemented weight by weight (w/w) with browses or legumes, (Wahynni *et al*., 1972). Some of the diets were high in CP above the 11 - 12% CP contents recommended as adequate for growing goats (NRC, 1981). The gross energy content of the different diets is consistent with published estimates for forages fed to ruminants in tropical and sub-tropical countries of the world (Butterworth, 1964).

Voluntary feed intake, growth rate and feed efficiency. Goats in the control group consumed an average of 320 and 300 g/head/day of fresh Batiki grass (49.34 and 41.18 g/kg$^{0.75}$ /day) in experiments 1 and 2 and these are below the standard forage intake of 80 g DM/kg M $^{0.75}$ suggested by Crampton *et al*. (1960) for tropical forages that were proportionately 0.70 digestible. Generally ruminant livestock in Samoa and some other Pacific Island countries graze Batiki grass without supplementation to meet their minimal requirements for maintenance, growth, reproduction and lactation.

Supplementation of Batiki grass with *Gliricidia* and *Leucaena* improved total voluntary feed intake of the goats. The increased voluntary intake observed in both experiments with incremental levels of supplementation of Batiki grass with either *Gliricidia* or *Leucaena* may be due to the fresh form at which they were presented to the goats. Increase in voluntary intake of fresh *Gliricidia* and *Leucaena* at high levels of supplementation have been reported (Smith *et al*., 1995) for growing West African Dwarf sheep and for Yankassa rams (Balogun & Otchere 1995), respectively in Nigeria. Also, Abdulrazak *et al*. (1996) reported increased dry matter intake with *Leucaena* but not *Gliricidia* when both browses were used as supplements to napier grass in the diets of steers in Kenya.

There was an increase in daily protein intake with progressive increase in levels of supplementation of Batiki grass with both browse species (Table III). The improved feed intake in both experiments could have resulted due to faster rumen outflow rate and the provision of more degradable organic matter. In both experiments *Gliricidia* and *Leucaena* were readily consumed and the goats did not reject any of the diets offered. However, *Leucaena* diets were more accepted than those of *Gliricidia*. Voluntary intake of Batiki grass was enhanced with incremental levels of supplementation with either *Gliricidia* or *Leucaena* browses.

Growth rate of goats in both experiments is within the level reported by Solomona (1988) for growing goats on Batiki grass as sole diet in Samoa. The higher body weight and daily live-weight gains of goats in either *Gliricidia* or *Leucaena* could be associated with higher voluntary feed intake. Compared to the control diets, the addition of *Gliricidia* or *Leucaena* at the various incremental levels of supplementation improved N utilization; provided more rumen degradable N that resulted in increased consumption; improved feed efficiency and subsequently live weight gains. The above indicated that the nitrogen from the browses contributed to improve live-weight gains of goats in both experiments.

In both experiments the goats fed on either + 80 Gli or + 80 Leu diets had relatively higher voluntary feed intake but lower body weight and daily live-weight gains compared to the other supplemented groups. These diets were however, higher in CP and GE contents than the 13.3% CP plus 13.4 MJ GE/kg BW suggested by Kumar (2000) as adequate for growing crossbred Anglo-Nubian goats in Samoa. Feed efficiency of the supplemented goats was relatively better than the control diets but the differences were of no statistical significance.

Apparent nutrient digestibility coefficients. The improved digestibility of supplemented Batiki grass diets above the control diets in both experiments 1 and 2 are consistent with other studies (Siebert & Hunter, 1982; Smith *et al*., 1995; Balogun & Otchere 1995). Supplementation of Batiki grass with either *Gliricidia* or *Leuceana* increased the rate of digestion of DM, CP, OM and NDF by the growing goats. It was observed that digestibility of OM was better in the goats offered *Leucaena* diets, and this might be the possible reason for the better live-weight gain obtained.

DM, OM and NDF digestion (Table IV) of goats that received either + 80 Gli or +80 Leu diets were relatively low compared to other supplemented diets (not control diets). The low apparent nutrient digestion coefficients of DM and in particular OM and NDF could be responsible for the comparative low live-weight gains obtained. Both diets had higher CP content compared to others, however, it could be reasoned that there was a faster rate of passage from the rumen therefore the rumen microbes could not degrade them effectively. Also, it is possible that the availability of protein in the + 80 Gli or +80 Leu diets were modified by anti-nutritive factors such as coumarin and flavenol in *Gliricidia* and tannin in *Leucaena* (Smith *et al*., 1995; Petty *et al.*, 1998). Feed efficiency of the goats improved with incremental supplementation of Batiki grass with either *Gliricidia* or *Leucaena*.

In these trials, *Leucaena* caused better response in the digestibility of DM, CP, OM and NDF than *Gliricidia* (Table IV). Our data on apparent nutrient digestibility coefficients conflicts with Abdulrazak *et al*. (1997). They reported better response in digestibility of steers on *Gliricidia* supplement than those on *Leucaena*. The source of grass species; the age and species of ruminant used could be implicated for the difference response to the two browses. In terms of forage protein sources, *Gliricidia* and *Leucaena* are high in nutritive value and they could be incorporated as cheap protein sources for maintenance, growth, reproduction and lactation in the diets of ruminant livestock. Both browses have been effectively used in other tropical countries as supplements in the diets of cattle, goats and sheep (Osuji, 1987; Smith *et al*., 1995; Balogun & Otchere 1995; Abdulrazak *et al*., 1997; Orden *et al*., 2000; Ondiek *et al*., 2000).

CONCLUSION

Supplementation of Batiki grass with either *Gliricidia* or *Leucaena* improved voluntary feed intake, growth rate and nutrient digestibility of growing goats in both experiments. The acceptability of the two browses confirmed further that tropical browses are palatable and could offer considerable potential source of cheap protein while being productive. In conclusion, there was a decline in growth rate but not voluntary feed intake at the + 80 Gli and + 80 Leu diets. Data on growth rate and apparent nutrient digestibility coefficients suggest that both browses are potential protein sources in ruminants' diets. The best level at which either *Gliricidia* or *Leucaena* could be used to supplement Batiki grass to obtain maximum growth of crossbred Anglo-Nubian goats in Samoa would be at + 50 Gli or + 50 Leu, respectively.

Acknowledgements. The authors wish to thank Mr. Aca Nagatalevu, Secretary, School of Agriculture, Alafua

Campus, The University of the South Pacific, Apia, for granting permission to hire a part-time technician for both experiments. Also we wish to thank Mr. Mr. Salesa Leao Seiuli for his technical assistance and care of experimental animals.

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(Received 20 November 2003; Accepted 23 December 2003)