Growth performance of goat fed ration with different levels and modes of preparations of Tiger grass (*Phragmites vulgaris*)

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ABSTRACT

Ration containing 100% Tiger grass (*Phragmites vulgaris*), and 50% Fresh Tiger grass and 50% Fresh Napier grass combination gave positive effects on growth performance and economy of production of non-descript goat (P<0.5). However, fresh preparation is preferred by the goats over air-dry preparation and gives higher weight gain and consequently higher income. Analysis of variance shows significant differences among levels in total weight gain, feed consumption and gross profit margin. Insignificant differences were observed however, on total dry matter intake, in terms of percentage in body weight and feed conversion ratio. Significant differences were observed in the modes of preparation for all the parameters studied. Interactions between levels and preparations were not comparable in all parameters except for total dry matter intake and dry matter intake as percentage of body weight. Tiger grass increases the growth performance of non-descript goats. The use of Tiger grass as roughage for goat is economically viable. The best growth performance was attained by the goats fed with 50:50 Fresh Tiger grass and Fresh Napier grass combination but the same is comparable with 100% Fresh Napier grass.

Keywords: fed ration, goat, growth performance, tiger grass

1.   INTRODUCTION

Tiger grass (*Phragmites vulgaris*) is a non-conventional feed resource. Non-conventional feed resources are feed that have not been traditionally used in animal feeding and not normally used in commercially produced ration for livestock. Thus, Tiger grass is feasible as feed for ruminants due to the cellulose and energy it provides for the herbivore animals. It is high in magnesium content (2.65 g/kg), potassium (10.9 g/kg) and manganese (97.0 mg/kg), this can be compared with wheat straw (41. 8%) This indicates the possibility of using common reed as a partial replacement of roughage for ruminants [1].

The leaves of Tiger grass are good forage for ruminants like goat, cattle and other farm animals like the carabao. The crude protein content of *Phragmites* and in vitro

dry-matter digestibility (IVD) decreased and the crude fiber increased with ageing. There was a significant negative correlation between the CP and CF content. There was a significant positive correlation between IVD and crude protein content, but with a significant negative correlation with the fiber content. Forage from range or pasture and in the forms of hay, soilage and crop residues is the primary basis of the existence of ruminants and their efficient production. Forage can be converted by cattle and other ruminants from an unusable product for human consumption to a highly preferred consumer product which is the meat. Taylor (1994) cited that beef producers are interested in having large amount of highly palatable, nutritious forage available for grazing [2]. According to Roxas (2006), the practice of cut-and-carry system (zero grazing), is very common in feeding draft animals, in feedlot fattening cattle, and in forage trading especially near the metropolitan areas [3]. Relative to this, the study regarding the effect of using Tiger grass as feed for farm animals such as goats is the main objective of this study.

2. METHOD AND MATERIALS

2.1. Preparations of Tiger Grass

The study utilized a 3x2 factorial field experiment in Randomized Complete Block Design (RCBD) with 4 replicates. The treatments were coded as follows:

Factor A – Levels of Tiger grass on the ration:

0% Tiger grass+100% Napier Grass

50% Tiger grass +50% Napier Grass

100% Tiger grass+0% Napier Grass

Factor B – Preparations of Roughage:

Fresh

Air – dry

The treatment combinations are as follows:

T1 = fresh, 0% Tiger grass+100% Napier Grass

T2 = fresh, 50% Tiger grass + 50 % Napier Grass

T3 = fresh, 100% Tiger grass + 0% Napier Grass

T4 = air dry, 0% Tiger grass + 100% Napier Grass

T5 = air dry, 50% Tiger grass + 50% Napier Grass

T6 = air dry, 100 0% Tiger grass + 0% Napier Grass

The experimental unit was consisting of 24 non-descript doweling goats which were selected and placed in each block according to age (5-6) months and weight which was determined by the initial weighing of the experimental animals at the start of the experiment. Sampling unit consists of only one goat.

2.2. Special Techniques and Procedure

The study was conducted following the procedure based on the outline section. Analysis of the nutrient composition of the samples, were done at the Regional Feed Laboratory at Maraouy, Lipa City, Province of

Figure 1. Field layout of the study
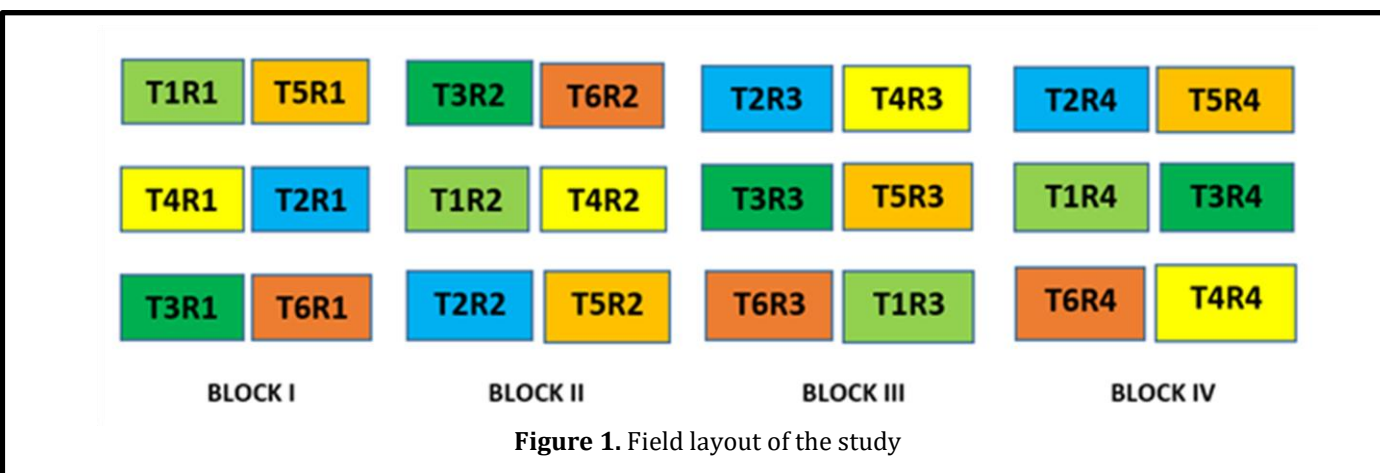
Batangas, Philippines.

2.3. Experimental animals

Twenty doweling goats were selected and used in this study. They were grouped into 3 according to their weights and age. This was done because the age affects the efficiency of animals in roughage utilization. The grouping served as the block.

2.4. Initial Weighing of the Experimental Animals

The weight of the experimental animals was taken at the beginning of the experiment and served as the initial weight. This guided the researcher in the blocking procedure to minimize the error of the experiments. Goats with almost uniform weight and age were assigned per block so that the treatments were represented equally in terms of weight and age in every block.

2.5. Preparation of Experimental Rations

Mixing of the freshly-cut and air-dried roughages according to the different levels and treatment combinations were done daily prior to representing the roughages to the goats.

2.6. Feed Intake of Animals (feed basis)

Weights of the unconsumed roughages daily were recorded and the amount of which were subtracted from the actual roughages given to goat. The difference was intake of the animal in as fed basis. However, the feeders were made in such a way that the losses in feeds were minimized.

2.7. Total Dry Matter Intake (TDMI)

The total dry matter intake of the animals was determined by multiplying the total fresh intake of the animals by the dry matter content of roughage given to goats.

2.8. Dry matter as percentage of body weight

Dry matter as percentage of body weight was calculated by dividing the average daily fry matter intake by the weight of the goat and multiplying the result by 100. Average dry matter intake was calculated by dividing the total DM intake by the number of fattening days.

$$DM = \frac{\text{Total DM intake / No. of days}}{\text{Weight of the animal}} \times 100$$

Where:

DM= intake as percentage of body weight

2.9. Feed Conversion Ratio (FCR) (kg DM/kg weight gain)

The FCR of individual animal was calculated by dividing the total DM intake by the total weight gain.

$$FCR = \frac{\text{Total weight of DM consumed (kg)}}{\text{Total weight gain (kg)}}$$

Where:

FCR: Feed Conversion Ratio

Gross Profit Margin. Usefulness of Tiger grass in combination with Napier grass with regards to economic aspect of goat production was determined by Gross Profit Margin. Gross profit margin was computed using the formula [4]

$$\text{Gross Profit} = \frac{\text{Revenue–Cost of Goods Sold}}{\text{Revenue}} \times 100$$

2.10. Data Processing and Statistical Analysis

The data collected were organized, tabulated and analyzed. SAS software was used for Analysis of Variance (ANOVA), differences among means were

Table 1. Initial weight of goats (kg)

Preparation Mean	Level		
	0%	50%	100%
Fresh 10.500	10.45	10.525	10.525
Air-dry 10. 575	10.65	10.575	10.5
Mean	10.55	10.55	10.513

Source	F Value	P Value
Block	1790.54	< 0.0001
Level	0.3	0.7456
Preparation	2.69	0.1215
Level*Preparation	2.1	0.1576
CV = 1.062%		

Table 2. Effect of levels and preparation of Tiger grass on total weight gain of goats (kg)

Preparation Mean	Level		
	0%	50%	100%
Fresh 1.492	1.525a	1.500a	1.450a
Air-dry 1.100	1.650a	1.000b	1.650b
Mean	1.588	1.25	1.05

Source	F Value	P Value
Block	23.99	< 0.0001
Level	8.92	0.0028
Preparation	13.9	0.002
Level*Preparation	6.73	0.0082
CV = 1.062%		

Means followed by the same letters are not statistically different by DMRT ($\alpha = 0.05$)

determined through Duncan Multiple Range Test (DMRT).

3. RESULT AND DISCUSSION

3.1. Initial Weight

Significant difference was observed within the blocks ($P < 0.05$) (Table 1). This indicates that the blocking technique is effective and the selection process made with regards to assigning the experimental animal within the block is useful, and that the experiment has a good result because the bias was eliminated. The initial weights of doeling goats ranged from 8.0 kg – 12.90 kg and 5 to 6 months of age.

This result justifies the use of Randomized Complete Block Design (RCBD) in the study as this design caters for the differences in the weight and age of the goats as experimental used in the study.

3.2. Total Weight Gain

Analysis of variance shows that the means of fresh preparation in all levels and the 0% dry preparation of Tiger grass are comparable but are not comparable with

Table 3. Effect of levels and preparation of Tiger grass on feed consumption of goats (kg)

Preparation Mean	Level		
	0%	50%	100%
Fresh 90.654	136.915a	100.658b	34.388c
Air-dry 68.097	135.428a	34.495c	34.370c
Mean	136.172	67.577	34.379

Source	F Value	P Value
Block	7.75	< 0.0023
Level	90.02	0.001
Preparation	12.75	0.0028
Level*Preparation	11.91	0.0008
CV = 19.497%		

Means followed by the same letters are not statistically different by DMRT ($\alpha = 0.05$)

Table 4. Effect of levels and preparation of Tiger grass on total dry matter intake of goats(kg)

Preparation Mean	Level		
	0%	50%	100%
Fresh 90.921a	30.245	30.358	32.160
Air-dry 28.400b	30.138	27.680	27.383
Mean	30.191	29.019	29.771

Source	F Value	P Value
Block	41.34	< 0.0001
Level	0.50	0.6165
Preparation	6.75	0.0202
Level*Preparation	1.94	0.1786
CV = 8.014%		

Means followed by the same letters are not statistically different by DMRT ($\alpha = 0.05$)

the mean of 50% and 100% dry Tiger grass. However air-dry preparations of tiger grass at 50% and 100% levels are comparable.

Lowest weight gain average was 0.65 kg observed in 100% Air-dry Tiger grass, while the highest gain average is 1.65 kg observed in 0% Air-dry Tiger grass, but the values are comparable with 505 Fresh Tiger grass + 0% Fresh Napier grass combination (Table 2). Duncan Multiple Range Test shows that the difference between fresh and air-dry preparations were significant at $\alpha = 0.05$ in terms of weight gain of the goats.

All the treatments produced an increase in weight although in different amounts which coincide with the statement of Lopez (1998) that even when grazing and consuming varieties of roughage alone or in the absence of concentrate supplementation, ruminants can thrive and produce a product [5]. This finding also coincides with the findings of Patil, Mali and Narkhede (1996) that all roughage diet is possible without any setback in ruminant production since they can utilize roughages as feed efficiently [6].

This result also is in conjunction with the findings of Baran *et al.* (2004) who concluded that *Pragmites* is a

Table 3. Effect of levels and preparation of Tiger grass on dry matter intake as percentage of body weight of goats (kg)

Preparation Mean	Level		
	0%	50%	100%
Fresh 3.933b	3.785	3.818	4.198
Air-dry 4.379a	4.293	4.340	4.503
Mean	4.093	4.079	4.351

Source	F Value	P Value
Block	8.80	0.0013
Level	2.51	0.1146
Preparation	13.01	0.0026
Level*Preparation	0.32	0.7288
CV = 7.272%		

Means followed by the same letters are not statistically different by DMRT ($\alpha = 0.05$)

very important source of cellulose and energy and the use of common reed or Tiger grass as a source of roughage in ruminant nutrition is interesting because it is a reach source of nitrogen [1]. From mineral composition point of view, has as relatively high micronutrient content which indicate a possibility of using common need (especially as a source of nitrogen, magnesium, potassium and manganese) as a partial replacement of roughage for ruminants.

3.3. Feed Consumption

The feed consumption of the goats was affected by the levels and preparation of *P. vulgaris*. Analysis of variance shows that there were significant differences (P< 0.05) between the different levels and preparations of Tiger grass as well as the interaction between these two factors. Preparation means, show that goats consumed higher fresh preparation 90.654 kg as compared with air-dry preparation of 68.097 kg and are not comparable with each other by DMRT at $\alpha = 0.05$ (Table 3).

3.4. Total Dry Matter Intake

The modes of preparation mean, with regards to the total dry matter intake of the goats were not comparable by analysis of variance (P< 0.05). However, levels means as well as the interaction of levels and modes of preparation were comparable. Higher means total dry matter intake was obtained from fresh preparation 30.921 kg as compared with air-dry preparation of 28.44 kg and is not comparable by DMRT at $\alpha = 0.05$ (Table 4).

Lesser intake of air-dry roughages by goat was observed as compared with fresh preparation, hence differences in dry matter intake is likewise expected. Fresh grasses have higher feeding quality and more preferred by ruminants over air-dry or hay preparations.

The daily feed intake of goat ranges from 0.1 to 0.8 lb/day. The daily feed intake is influenced not only body weight, % of dry matter in the feed eaten and physiological stage of goats but also by palatability of the feeds [7].

3.5. Dry Matter Intake as Percentage of Body Weight

Statistical analysis of the Data for Dry Matter Intake as Percentage of Body weight shows significant difference on the modes of preparation but the levels and the interaction between levels and mode of preparation are comparable (Table 5). This result coincides with the

findings of Ketelaars (1993), that there is positive relationship between feed intake and feed characteristics as well as intake and digestibility, and that hay is less palatable for goats than fresh grasses [8]. The forage quality is the primary factor affecting the estimated daily feed intake of the ruminants, as forage digestibility decreases, the intake level of that forage also decreases. Hoffman and Kester (2013) cited that DMI as percent of body weight is influenced by non-digestibility fiber (NDF) concentration [9]. Low NDF diets increase DMI and high NDF diets decrease DMI within any body weight category. These findings though were not consistent with the result of the study as fiber content of the feed given to the goats was rather low because of very young age of the Tiger grass used (30-60 days).

3.6. Feed Conversion Ratio

ANOVA on the mean feed conversion ratio of goats shows that the difference between fresh and air-dry preparation is not comparable as well as the interaction between levels and preparation of Tiger grass. However, level means are comparable. The lower value of 26.780 for the Fresh preparation indicates a higher feed conversion ratio among goats fed with fresh Tiger grass and the higher value of 40.035 observed in air-dry preparation indicates that goats need more roughage to have a kilogram gain. DMRT at $\alpha = 0.05$ revealed that difference between preparation mean as well as the interaction of levels and preparation except for pure Napier grass are not comparable.

Grasses when cut young and fresh could give higher advantage in terms of feeding quality to ruminants. On the other hand, study shows good potentials of Tiger grass as hay as well, because of their fairly good nutritive value [10]. Especially when harvested and

prepared before heading and Patil *et al.* (1996) observed that all roughages as feed efficiently [6].

The FCR of the goats used in the study in general with regards to the different levels of tiger grass is comparable on the effect of feeding inoculated Common Reed silage in fattening buffalo male calves which shows comparable effects on fattening characteristics including feed conversion efficiency and cost of feed consumption per one kg of live gain Although the result was from another species of ruminant. Common Reed could give to ruminants as substitute to common roughages without any harmful effect or setback as regards to the FCR of the animals, but fresh preparation is better as regards to the FCR of the goats thus, preferred over air-dry preparation [11].

4.   CONCLUSION

The Tiger grass provides a positive result in the growth performance of the goats in terms of their body weight. The nutrient content of the studied grass is suitable for the weight gain of the goats, and the possibility that it could be feasible also for other ruminants.

5.   ACKNOWLEDGEMENT

6.   CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

7.   SOURCE/S OF FUNDING

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