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### Growth performance of goats as affected by supplementation of medicinal leaves

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#### Abstract

This study was conducted to see the effect of *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* leaf mixture (1:1:1) in concentrate mixture at 5% and 10% level. Eighteen Assam hill goats were divided into three groups-T<sub>1</sub> served as Control. In treatment T<sub>2</sub> and T<sub>3</sub>, the concentrate mixture was replaced with 5 and 10% level of leaf mixture respectively. Daily weight gain of kids did not differ significantly between groups but significant difference was found in final body weight between group T<sub>2</sub> and T<sub>3</sub>. Feed conversion efficiency was not significantly influenced by the feed supplement in the diet. It was concluded that the leaf mixture of *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* could be used upto 10% level as supplement in the diet of goats.

**Keywords:** Body weight, *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica*

#### Introduction

Livestock are an important part of the agriculture sector and has a major role in national economy. An eco-friendly alternative to increase the growth of animal is a great challenge for animal nutritionists [1]. Beneficial effects of medicinal plants in farm animals may be due to the activation of feed intake and the secretion of digestive juices, immune stimulation and anti-bacterial property. They can also contribute to the nutrient requirements of the animals; stimulate the nutrient metabolism and activate the endocrine system [2]. The medicinal plants contain saponins, phenolics, peptides, polysaccharides, alkaloid, lignans and polyacetylenes, in which saponins was considered principal bioactive ingredients [3, 4], which used to provide cardio-protective, immune stimulatory, anti-fatigue and hepatoprotective effects [5]. Saponins containing plants can suppress or eliminate protozoa from the rumen and reduce methane and ammonia production. In order to improve nutritive value of fibrous crop residues, farmers mostly used protein supplements (oil cakes, bran and cereals), but the high cost and poor accessibility of these protein supplements is prohibitive. Trees and shrubs are the great source of dietary protein supplements [6]. There is an increase in demand of medicinal plants and the benefits of herbal feed additives in improving growth performance have been reported [7, 8]. Papaya, Jackfruit and Bhumura are rich source of phytochemicals including enzymes (in the latex), carotenoids (in fruits and seeds), alkaloids (in leaves), phenolics (in fruits, leaves, and shoots), and glucosinolates (in seeds and fruits) [9]. Keeping this background in view the experiment was undertaken to assess the effect of *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* leaf mixture as supplement along with concentrate mixture on growth performance of goats

#### Materials and Methods

The experiment was conducted at Goat Farm, College of Veterinary science AAU Khanapara, Guwahati. Eighteen Assam hill (local) kids of 3-4 months of age and average 6-8 kg body weight were procured locally. Prior to the start of the actual experiment the animals were conditioned for a period of 15 days during which they were treated with ecto and endo parasites. During the conditioning period, the animals were fed a standard concentrate mixture @100g per day and ad libitum green fodder. The feeding trial was performed for a period of 120 days followed by a metabolic trial for 7 days. The control diet was formulated to be representative of a commercial concentrate. The leaf meal mixture component of concentrate contained sun-dried ground leaves of *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia*

*bellirica*. The leaves were individually sun-dried and ground in an electric grinder before mixing them in the ratio of 1:1:1 on DM basis. Treatment groups contain T<sub>1</sub> (5%) and T<sub>2</sub> (10%) level of leaf mixture. Concentrate diet was given daily morning and evening. Green fodder was given *ad libitum*. Daily DM intake and fortnightly body weight of all the animals were recorded throughout the study. During the digestive trial, the goats were housed in individual metabolic cages with arrangements for quantitative collection of faeces and urine separately. The trial lasted for 10 days with 3 days adaptation period to accustom the goats to cages prior to a 7 days collection and measurement period. Samples of feed offered and refused were collected daily and kept in a hot air oven at 80±2°C for dry matter (DM) estimation. The dried material obtained during the trial period was pooled, ground and stored at room temperature for chemical analysis. Similarly, total daily faecal output was recorded and a sub-sample collected and dried in a hot air oven to a constant weight for dry matter estimation. Representative samples of individual daily faecal and urine collection were pooled for 7 days and preserved in diluted (1:4) sulphuric acid for N estimation. The other sub-samples were retained for further chemical analysis in a freezer. Proximate analysis and cell wall components were determined by the method of AOAC [10]. Data were compiled, tabulated and analysed using Statistical Package for Social Sciences (SPSS 11.5).

## Results and Discussion

### Chemical Compositions

The chemical composition of three concentrate mixtures used in this experiment is shown in Table 1. The experimental concentrates offered were isonitrogenous and with similar levels of organic matter. T<sub>3</sub> concentrate has higher Ether extract and Ash in comparison to control and T<sub>2</sub> group. This might be due to the presence of carotenoids, xanthophylls and minerals especially calcium in tree leaves which increases the ether extract and ash content, respectively (11)

**Table 1:** Ingredients and chemical composition of supplements

Ingredients	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Maize	65	56	60
Wheat Bran	20	25	20
GNC	12	11	7
Min. mixture	2	2	2
Salt	1	1	1
Medicinal Leaves	----	5	10
Chemical composition (%DM)			
Dry matter	88.34	86.8	89.34
Organic matter	93.6	91.56	92.22
Crude protein	19.8	22.1	20.26
Ether extract	2.89	2.5	2.67
Crude fibre	9.56	11.23	12.67
Nitrogen free extract	60.86	57.94	57.3
Total ash	6.89	6.23	7.1
Calcium	0.28	0.25	0.22
Phosphorous	0.60	0.53	0.56

**Table 2:** Effect of dietary supplement on body weight, daily gain, feed efficiency (gain: feed) in broiler chickens

Particulars	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Initial Body weight (kg)	6.98±0.27	6.78±0.19	7.2±0.26
Final body weight (kg)	10.28±0.32	9.76±0.23 <sup>b</sup>	11.01±0.26 <sup>a</sup>
Average total gain in body weight (kg)	3.25±0.09	2.96±0.11	3.55±0.14
Rate of mean daily gain in live weight(gm)	27.5±1.34	24.8±0.84	31.75±0.50
Feed conversion efficiency	5.56±0.15	5.69±0.14	4.43±0.14

### Weight gain

The rate of mean daily gain in live weight in T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 27.5±1.34, 24.8±0.84, 31.75±0.50. The present work showed that supplementing diets with *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* did not show any significant difference in average daily weight gain but there was a highly significant difference ( $p < 0.01$ ) in final body weight in T<sub>2</sub> and T<sub>3</sub> groups. Higher level of concentrate supplementation with herbal leaf mixture increased daily live weight gain of kids [12]. These differences may be due to difference in medicinal plants, breeds, and climate and management system.

### Feed conversion Efficiency

Feed Conversion Efficiency in Assam Hill Goat of T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> ranged from 5.56 to 5.69 (Table 2). Feed efficiency was not significantly affected by diet throughout the experimental period.

### Growth rate

The growth rates of kids fed at different levels of concentrates are presented in Table 3. Significant difference was found between T<sub>2</sub> and T<sub>3</sub> group. Goats given a supplementation of concentrates were heavier from 4 to 6 months of age than goats that were only allowed to browse [13]. There is very little information available with regards to supplementation of *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* growth performance in goats.

**Table 3:** Fortnightly gain in body weight of kids

Fortnightly	Groups		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
0	6.98±0.27	6.78±0.19	7.2±0.26
1 <sup>st</sup>	7.31±0.28	6.93±0.20	7.48±0.27
2 <sup>nd</sup>	7.75±0.26	7.2±0.23	7.91±0.31
3 <sup>rd</sup>	8.21±0.22	7.56±0.21	8.35±0.31
4 <sup>th</sup>	8.65±0.24	8.03±0.20	8.75±0.22
5 <sup>th</sup>	9.05±0.23	8.48±0.21	9.2±0.23
6 <sup>th</sup>	9.45±0.22	8.93±0.20	9.61±0.27
7 <sup>th</sup>	9.82±0.27	9.35±0.22	10.03±0.27
8 <sup>th</sup>	10.28±0.32 <sup>ab</sup>	9.76±0.23 <sup>b</sup>	11.01±0.26 <sup>a</sup>

The growth in the T<sub>3</sub> group with supplementation with medicinal leaves showed a better result than the T<sub>1</sub> fortnightly and was significant ( $P < 0.05$ ) only on 8<sup>th</sup> week between the groups fed with T<sub>2</sub> and T<sub>3</sub>.

Papaya leaf extracts possesses antioxidant, free radical scavenging and ion-reducing capacity [14, 15]. *Terminalia belerica* leaves are also a potential source of phenols, natural antioxidants [16]. The leaves of Jackfruit are routinely used in local Ayurvedic preparations as they are rich source of antioxidant [17]. Growth is a trait that is affected by the intake of dietary antioxidants [18]. The high metabolic rate of growing tissues produces large amounts of free radicals [19], and if they are not safely removed by antioxidants, may lead to oxidative stress. Therefore, antioxidant supplementation may help to counteract negative effects of oxidative stress

associated with growth. Because growth is extended to numerous tissues, it is likely to be affected by the overall oxidative status of an individual. It is reasonable to speculate that those antioxidants with the highest antioxidant potency and environmental abundance, that is, polyphenols, would play an important role during growth [18, 1]. Since *Carica papaya*, *Artocarpus heterophyllus*, *Terminalia bellirica* are reported [20] to have antimethanogenic activity. Tannin and saponin are responsible for reducing methanogenesis in rumen liquor.

Antimethanogenic activity of leaves increases the growth rate in ruminants because feeding of these leaves causes less production of methane and so less carbon atom is lost as methane and the carbon atom is used for protein synthesis that increases the growth. So feeding of these leaves at 10% level increased the growth of the kids.

### Conclusion

It can be concluded from the results of the study that supplementation of concentrate feed with *Carica papaya*, *Artocarpus heterophyllus*, and *Terminalia bellirica* revealed better performance in goats and it had no significant effect on blood biochemistry.

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