Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP1: 2822-2824

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Effect of Subabul (*Leucena leucocephala*) based complete rations on performance of kids

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Abstract
The present study was conducted with objective to estimate the chemical composition of *Leucena eucocepahala* leaf meal and to formulate complete rations containing untreated *Leucena leucocepahala* leaf meal (ULLLM) and treated *Leucena leucocepahala* leaf meal (TLLLM) at 30 and 40 parts, to study growth performance and digestibility in kids. A growth trial was conducted for 90 days with 30 kids (9.00 kg±0.150) by allocating at random to five complete rations CR1 (control), CR2 (30% ULLLM), CR3 (30% TLLLM), CR4 (40% ULLLM) and CR5 (40% TLLLM). There was decrease of 63% mimosine content and the dry matter loss of 9.4% in treated *Leucena leucocephala* leaf meal. The difference among the digestibility of nutrients was non-significant. The ADG (g/d) was higher ($P<0.05$) in CR1 (37.7) followed by CR3 (35.92) fed group. The result of present study indicated that the treated *Leucena leucocephala* leaf meal can be included at 30% level in complete ration of growing kids as replacement of concentrate mixture under intensive system of rearing shown better performance in kids.

Keywords: Subabul leaf meal, complete feed, growing kids, nutritive value, moist method

Introduction
In India small ruminants are having important economic value to the small and marginal farmers and landless laborers, which are managed in a traditional method of production system mainly based on grazing / browsing. India possess 133 million goats producing 0.511 million tons of chevon (FAO, 2014)[1]. The goat population is progressively increasing at the same time the total area of grazing has fallen by 47% resulting in over stocking and over grazing of available land (Shende, 2002)[2]. To meet the requirement of food demand for the rapidly increasing population there should be equivalent increase in animal production. But the intensive system is expensive due to increase in the cost of conventional feed ingredients. This is attributed to the increased competition between livestock species and human beings, which has led to the increased demand leading to scarcity of the conventional feed ingredients.
In this context, the role of fodder trees in the diet of animals is considered particularly important in the developing countries like India. Legume forages provide required critical nutrients when included at catalytically levels to attain acceptable rate of gain in small ruminants (Preston and Leng, 1987)[3]. The fodder tree leaves like *Leucena leucocephala* contain significant levels of readily digestible cellulose and hemicelluloses and provide adequate rumen metabolites resulting in increased dry matter and nitrogen digestibility (Silva and Orskov, 1988)[4]. The tree leaves can be harvested, sundried, preserved and used in compounded feed as protein supplements. The replacement of conventional ingredients by tree leaves will make such supplements cheaper than the commercial concentrates. Although *Leucena* possesses several characteristics that make it a high quality animal feed for livestock production, foliages of leucena also possess a toxic secondary metabolite, mimosine, which inhibits its usage. Hence an attempt was made to detoxify the *Leucena leucocephala* leaf meal before its inclusion in the complete rations as replacement of concentrate mixture. Keeping this in view, the experiment was undertaken to assess the suitability of treated *Leucaena leucocephala* leaf meal as a component of complete feed at different levels of inclusion as a replacement of concentrate mixture.

Materials and Methods
The *Leucena leucocephala* leaf meal (LLLM) used for experiment was processed by subjecting to moist heat. The portable soft water was boiled until 70°C temperature is attained and then Leaf meal was added in a ratio of 1: 10 (1 kg leaf meal to 10 litres of water) and soaked for 30 minutes and then drained. Again the leaf meal was soaked for time 15 minutes. At the end of 15 min water was drained and leaf meal sample was retained. This leaf meal was sundried to reduce the moisture content to 10-15%.

About 30 non-descript (ND) local kids (9.20 ± 0.150 kg) randomly (CRD) divided into five equal groups of six each and growth trial was carried out for 90 days. Five dietary treatments i.e. CR-1 to CR-5 at different levels of *Leucena leucocephala* leaf meal (LLLM) inclusion were formulated (Table 1)

Table 1: Ingredient composition (%) of complete rations

Ingredient	CR1	CR2	CR3	CR4	CR5
Jowar hay	60.0	60.0	60.0	60.0	60.0
Maize grain	19.0	0.5	0	0	0
Soybean meal	18.5	7.0	7.5	0	0
ULLLM	0	30.0	0	40.0	0
TLLLM	0	0	30.0	0	40.0
Mineral mixture	2.0	2.0	2.0	0*	0*
Salt	0.5	0.5	0.5	0*	0*
Total	100.0	100.0	100.0	100.0	100.0

The kids were housed individually in pens of 2 X 1 m dimensions in a pucca shed. Feed and water was provided to the animals individually. The animals were dewormed at the start of the growth study and at regular intervals with broad-spectrum anti-helmenthitics. They were also vaccinated against H.S., PPR, and Enterotoxaemia during the study. During the trial, feed intake was recorded daily. Weighed quantity of feed was offered to the kids twice daily at morning 9.00 AM and at 4.00 PM. The left over feed if any was weighed and recorded next day morning to obtain an estimate of intake.

The experimental rations left over feed samples were ground to pass through 2 mm sieve for the chemical analysis, proximate composition (AOAC, 2005)[5], cell wall fractions (Goering and Van Soest, 1970)[6]. The mimosine content in the feed samples were determined using HPLC in Bangalore laboratory of ITC Company. Mimosine in feed was analysed by high performance liquid chromatography (HPLC) by the method of Tangendjaja and Wills (1980)[7]. The data were subjected to one way analysis of variance using SPSS version 10.0.

Results and Discussion

The chemical composition of the feed ingredients and complete rations were given in the table 2. The dry matter (DM) loss of 9.4% was seen in treated *Leucena leucocephala* leaf meal. The crude protein (CP) of LLLM did not vary much with the treatment. The CP of LLLM was similar to the findings of Devasena (1993)[8]. There was a marked reduction in ether extract (EE) in treated LLLM (2.98%) when compared to untreated LLLM (4.51%). This may be due to the moist method of deactivation of mimosine. There was a decrease of 63% mimosine content in treated *Leucena leucocephala* leaf meal. However Report of Tawata *et al.*, (1986)[9] showed leaching of LLLM with 0.05N Sodium acetate detoxified 95% mimosine without loss of any important nutrients.

Table 2: Chemical composition (%) of feed ingredients and complete rations

Parameter	ULLLM	TLLLM	CR1	CR2	CR3	CR4	CR5
DM	89.90	95.50	91.20	91.23	91.37	91.18	91.75
OM	92.30	88.89	90.29	87.63	90.79	88.56	89.86
CP	21.08	20.11	14.09	14.08	13.95	13.20	12.80
EE	4.51	2.98	0.86	2.19	2.70	2.77	3.46
CF	15.96	19.78	24.85	21.98	25.12	24.57	28.23
TA	7.70	11.10	9.70	12.36	9.20	11.43	10.13
NFE	50.75	46.03	50.5	49.39	49.03	48.03	45.38
Mimosine	3.179	1.172	0	0.953	0.352	1.271	0.469
NDF	55.55	50.60	70.29	43.53	55.62	41.63	59.49
ADF	21.22	25.87	37.15	22.91	31.13	21.42	36.73
Hemicellulose	34.33	24.73	33.14	20.62	24.49	20.21	19.76
Cellulose	13.73	17.94	21.59	16.06	17.78	14.1	21.34
Lignin	8.33	8.76	7.97	5.01	7.92	4.89	8.93

The digestibilities of kids fed with experimental ration were shown in the Table 3. There was no significant difference among the digestibilities of nutrients, however the CP digestibility is highest in CR1 Fed group followed by CR3 fed group which were similar to the findings of Srivastava and sharma[10] (1998) when included in 20 % level of inclusions of LLLM

Table 3: Nutrient digestibility (%) in kids fed on complete rations containing LLLM

Parameter	CR1	CR2	CR3	CR4	CR5	(P>0.05)
DM	69.13±3.09	59.77±4.02	68.53±2.30	62.79±3.83	66.21±4.80	NS
OM	70.01±4.54	65.56±3.60	68.82±3.37	63.99±6.80	65.88±2.65	NS
CP	71.76±4.17	65.96±2.52	69.23±2.29	63.16±4.94	64.27±4.40	NS
EE	74.81±3.04	64.52±2.66	71.03±4.29	60.01±8.46	67.28±5.41	NS
CF	56.93±9.32	51.02±4.77	59.33±5.40	49.09±7.95	54.07±3.32	NS
NFE	70.46±3.67	67.04±3.04	73.82±3.15	59.24±16.06	66.86±3.91	NS
NDF	53.76±18.50	46.77±5.09	55.98±3.23	43.08±5.12	52.16±4.42	NS
ADF	43.23±5.28	37.03±6.64	46.99±4.29	34.21±11.23	41.99±9.09	NS
Cellulose	54.93±8.25	47.86±5.50298	58.25±8.91	42.79±12.06	51.72±5.82	NS

The weight gain (kg) was highest (P<0.05) among kids fed with control ration (CR1) followed by CR3 fed group (Table 4). The values were similar to the research findings of Anbarasu *et al.*, (2004)[11] when 25% of LLLM was included in the rations. The ADG (g/d) was also highest (P<0.05) in CR1 (37.7) followed by CR3 (35.92) fed group. However Shaker *et al* (2014) [12] reported 38 g of ADG at 25 parts of inclusion of LLLM. The FCR was highest (P<0.05) in CR3 and CR1 and are comparable to other treatment groups.

Table 4: Growth performance of kids fed on complete rations containing LLLM

Particulars	CR1	CR2	CR3	CR4	CR5
Average initial body Weight (kg)	8.78±0.68	8.63±0.73	8.06±0.18	8.02±0.37	8.67±0.44
Average final body weight (kg)	12.18^{a}±0.68	10.60^{ab}±0.66	11.30^{ab}±0.24	10.12^{b}±0.29	11.38^{ab}±0.77
Weight gain (Kg)	3.40^{a}±0.20	1.97^{b}±0.35	3.23^{a}±0.08	2.10^{b}±0.32	2.70^{ab}±0.50
ADG(g/d)*	37.7^{a}±2.25	21.96^{b}±3.95	35.92^{a}±0.92	23.42^{b}±3.65	30.05^{ab}±5.60
DMI (g/d)	273.00±11	258.04±16.98	275.58±12.18	243.08±8.54	270.22±30.96
FCR (g DM/g gain)*	7.28^{b}±0.27	14.19^{a}±3.14	7.67^{b}±0.30	12.03^{ab}±2.26	10.67^{ab}±2.29

$^{a\,b\,c}$: Values in a row with different superscripts differ significantly * ($P<0.05$)

Based on the digestibilities and growth trial it can be concluded that, inclusion of treated LLLM at 30 %level in complete rations as a replacement of concentrate mixture in growing kids is beneficial.

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