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Effect of feeding *Moringa oleifera* leaf powder on growth performance of growing female black Bengal goat under semi-intensive system of management

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Abstract

The present research work was designed to evaluate the growth performance of growing female Black Bengal goat by using the four different concentration of *Moringa oleifera* leaf powder (0%, 10%, 15% and 20%) by weight basis in feed. A total of twenty four, 4 to 5 months old goats having 6-8 kg body weight were procured and after 10 days of adjustment period they were randomly divided into four experimental groups. Different combinations of feed were offered to them for a period up to 9 months of age. The investigation of above research work showed that goats fed on diets containing *Moringa oleifera* leaf powder (MOLP) gains significantly higher body weight and more body weight gain per day than that of goats feeding on control diet (0% MOLP). Body weight at the end of experiment was found to be 10.93±0.26, 12.05±0.19, 12.28±0.07, 12.03±0.16 kg respectively for T0, T1, T2 and T3 groups. It could be concluded that inclusion of MOLP at 10%, 15% and 20% in goats diet improves the growth performance than control diet however, the overall result on growth performance was shown by the goats fed with 15% MOLP.

Keywords: *Moringa oleifera* leaf powder (MOLP), black Bengal goat, growth performance

Introduction

Goat is considered as poor man's cow and it can be profitably reared with low investment under different systems of management. Goats are mainly raised by poor farmers and distressed women with little capital investment (FAO, 1991). They contribute significantly to the Indian economy by sustaining the livelihood and supplementing the income of the small farmers and rural Poor's. As per 19th census 2012 India contributes about 135.17 million to the world's goat population and occupies 2nd position in the world. Goat contributes about 26.4% of the total livestock population in India out of which 4.87% contributed by Jharkhand state having goat population 65, 81,449.

Among the various meat producing indigenous breeds of goats in India owned by small farmers and landless labourers, the black Bengal goat {*Caprahircus bengalensis*} is most common. Evidences from population structure and novel lineage in the Indian goats suggested that domestication started 10000 years ago (Manjunath B. *et al.*). Its native tract is sunderban area of west Bengal where typical animal having unique characteristics of black Bengal goats are available. It is distributed throughout Jharkhand, parts of Orissa, Assam and Neighbouring country Bangladesh. This breed is an important contributor particularly in the eastern region of India.

Moreover the performance of Black Bengal goat in Jharkhand is also poor due to scarcity of good quality forage and enriched nutritional supplements. Enhancement in nutritional additives can improve production performance of Black Bengal goat resulting into higher production yield.

Being herbal plant *Moringa oleifera* is considered as the most efficient because leaves contain higher amount of protein beside its several therapeutic and medicinal uses. *Moringa* is the sole genus in the flowering plant family *Moringa ceae*. It is locally known as Munga or Sahjan. One such plant is *Moringa oleifera*, commonly known as the drumstick tree (Makker and

Becker 1997)^[1]. There are about 13 species of *Moringa* trees in the family *Moringa ceae*. They are native to India, the Red Sea area or parts of Africa. The trees also grow in tropical and subtropical climates. The leaves of the trees have been reported to have an antioxidant activity due to higher amount of polyphenols (Mayo *et al.*, 2012). The major component of essential oil in *Moringa* leaf were Pentacosane, Hexacosane, E-phytol and 1-(2, 3, 6 trimethylphenyl)-2butanone. *Moringa oleifera* leaves are a rich source of vitamins. Its leaf meal may be a promising source of natural antioxidant for broiler meat. It also possesses antimicrobial activity due to its principle component pterygospermin. Thus Jharkhand is suitable for production of *Moringa* and is widely distributed in different hilly and plane regions of Jharkhand. *Moringa* is grown in the home gardens of West Bengal and Odisha too.

Materials and Methods

The present study was conducted at Instructional Small Ruminant Farm, Ranchi Veterinary College (RVC), Kanke, Ranchi.

Experimental animal and feeding management

A total of forty-eight (48) growing female Black Bengal goats selected from the herd at the instructional ruminant farm of RVC, Kanke were used in this study. They were 4-5 months of age and had an average body weight of 6-8 kg. All goats were treated with anti-helminthes (Albendazole @10mg/kg body wt.) Before the commencement of the experiment to ensure the goats will become free of intestinal worm. The goats were kept in individual pens measuring 1.75sqm (1.75 m × 1.0 m) under Semi-Intensive system of management and provided individual feeders and water buckets. Goats were allowed to graze 4 hours daily, rest amount of fodder were provided at stall.

Experimental procedure and design

A total of twenty four, 4 to 5 months old female goats were allocated. All the goats were divided equally into four groups with six animals per treatment. The four experimental treatments were: T1 = 100 % concentrate mixture + 0% MOLP, T2 = 90% concentrate mixture + 10% MOLP, T3 = 85 %, concentrate mixture + 15% MOLP, T4 = 80% concentrate mixture + 20% MOLP. Mixture feed were offered twice daily @3.5% of body weight on dry matter basis. Green fodder were made available ad.lib. To the goats at feeding stall. The feed were provided twice daily at 08:30 and 15:00 h. The feeders and water buckets were cleaned daily before offering the feed. Feed intake for each day during the collection period was determined by subtracting the offered feed to the feed refused. Before morning feeding, all animals were weighed at the commencement of the experiment and subsequently every week. The average daily live weight gains were calculated by regression of body weight of each animal on number of days of feeding during experimental period. The duration of the feeding trial was of 120 days.

Data obtained after experiment were analyzed as per the standard statistical methods described by Snedecor and Cochran^[2] (2004), applying one way ANOVA by using IBM SPSS (Statistical Package for the Social Sciences) statistics software.

Results and Discussion

All the groups under study exhibited (Table No.1) similar pattern of weekly increase in average body weight throughout

the experimental period which indicates linear growth in control and other treatment group. The weekly average body weights of T2 group were numerically higher than that of T0, T1, and T3 groups and the differences in average body weight were found to be statistically significant for most of periods under study. Under Semi-Intensive system of management Significantly higher body wt. was observe from 28th to 35th ($P \leq 0.05$) weeks and 36th ($P \leq 0.01$) weeks of age.

The average body weight was found to be significantly higher from the control group, however non-significant differences in body wt. were found for most of the periods under study. The overall mean of live body weight of Black Bengal goats under Semi-intensive system of housing were 9.26±0.32, 9.86±0.40, 9.94±0.44, 9.67±0.42 kg for T0, T1, T2 and T3 groups respectively which also reflects makeable difference in average body weights of all the groups.

The observations of present study shows no adverse effect of MOLP inclusion in concentrate mixture at different concentration of 10%, 15%, and 20% on body weight of experimental goats.

The results obtained in present study are in agreements with findings reported by Asaulo^[3] *et al.* (2012) and Tono^[4] *et al.* (2014) as they recorded better gain in body weight of goats fed on diets with inclusion of *Moringa oleifera*. However the result obtained by Sarwatt^[5] *et al.* (2002) who did not observe significant difference in body weight of East African goats fed with 0%, 25%, 75% and 100% level of *M. oleifera* leaves with the replacement of sunflower seed cake in the concentrate mixture. Similarly, Sultana^[6] *et al.* (2015) reported non-significant differences in body weight of Bengal goats fed on *Moringa* foliage.

The results of non-significant effect on growth with dietary inclusion of *Moringa* leaves reported by Divya^[7] *et al.*, (2014) in broiler chicken are not in accordance with the findings shown in present study in Black Bengal goats.

The above results on body weight growth of goats were due to the higher palatability, more digestibility and better absorption of MOLP.

The results shows (Table No.2) no definite trend in increase in average daily gain (ADG) in all the groups, however there was an irregular increase in body weight gain, seen in all the groups from starting of experiment up to 28th weeks of age. After that it was revealed that the ADG (g) shows declining, but not in a specific trend. In general the ADG (g) ranged between 19.05±3.01 to 83.33±8.58 g in either groups was observed. The overall mean of average daily gain in goats were 37.14±3.85, 46.67±5.11, 51.11±5.13 and 49.37±4.47g for T0, T1, T2 and T3 groups respectively which also reflects non-significant difference in average body weights gain of all the groups, The ADG was seen significantly ($P \leq 0.05$) different at 34th week of age.

The non-significant differences of ADG between control and other treatment groups at various weekly interval revealed no adverse effect on growth due to addition of *M. oleifera* leaf powder (MOLP) in goat feed. The lower average daily gain after 28th weeks of age may be due to change in ambient temperature during the period of study at that place. The observations Shows that ADG was not affected greatly on 10%, 15%, and 20% MOLP concentration incorporated in concentrate mixture, however the ADG was found better in different treatment groups in comparison to control group. The present findings are in accordance with Sultana *et al.* (2015) who reported comparable ADG in Bengal goats fed *M. oleifera* foliage at 0%, 25%, 50% and 75% by replacing

concentrate mixture. However, results obtained on ADG when goats fed diet with various concentrations of MOLP by Moyo *et al.* (2012) [8], Tona *et al.* (2014) [9] and Bebekar are not in tune with the above experiment as they reported

significant increase in the ADG.

The above results on body weight gain of goats were due to the more digestibility, better absorption and higher protein content of MOLP.

Table 1: Effect of Molp on Average Body Weight (Kg) of Black Bengal Goat Semi-Under Intensive System of Management.

Age/Treatment	T0	T1	T2	T3	F Value
21st wk	7.03±0.23	7.15±0.18	6.95±0.19	6.85±0.11	0.454 ^{NS}
22nd wk	7.32±0.25	7.42±0.20	7.32±0.17	7.15±0.10	0.327 ^{NS}
23rd wk	7.68±0.28	7.85±0.15	7.65±0.15	7.57±0.13	0.385 ^{NS}
24th wk	7.93±0.28	8.30±0.13	8.18±0.16	7.97±0.14	0.812 ^{NS}
25th wk	8.25±0.24	8.78±0.10	8.68±0.18	8.42±0.15	1.780 ^{NS}
26th wk	8.57±0.24	9.03±0.06	9.08±0.16	8.77±0.18	1.797 ^{NS}
27th wk	9.00±0.25	9.48±0.06	9.57±0.09	9.22±0.13	2.738 ^{NS}
28th wk	9.45±0.22 ^a	9.98±0.06 ^b	10.13±0.06 ^b	9.80±0.08 ^b	5.376 [*]
29th wk	9.77±0.24 ^a	10.52±0.07 ^b	10.67±0.06 ^b	10.32±0.06 ^b	8.519 [*]
30th wk	9.93±0.24 ^a	10.65±0.07 ^b	10.85±0.06 ^c	10.53±0.04 ^b	8.660 [*]
31st wk	10.12±0.24 ^a	10.82±0.07 ^b	10.98±0.04 ^c	10.73±0.06 ^b	7.890 [*]
32nd wk	10.30±0.26 ^a	11.08±0.09 ^b	11.25±0.09 ^c	10.95±0.06 ^b	7.630 [*]
33rd wk	10.47±0.25 ^a	11.25±0.10 ^c	11.48±0.09 ^c	11.13±0.08 ^b	8.484 [*]
34th wk	10.67±0.26 ^a	11.62±0.14 ^c	11.80±0.09 ^c	11.45±0.12 ^b	8.391 [*]
35th wk	10.80±0.28 ^a	11.80±0.09 ^b	12.08±0.10 ^c	11.77±0.15 ^b	8.830 [*]
36th wk	10.93±0.26 ^a	12.05±0.19 ^b	12.28±0.07 ^c	12.03±0.16 ^b	10.493 ^{**}
OVERALL	9.26±0.32	9.86±0.40	9.94±0.44	9.67±0.42	

Each value is the average of 6 observations.

* $P < 0.05$, ** $P < 0.01$, NS = Non-Significant

Table 2: Effect of Molp on Average Daily Weight Gain (G) of Black Bengal Goat under Semi- Intensive System of Management.

Age/Treatment	T0	T1	T2	T3	F Value
21st wk	40.48±5.73	38.10±4.76	52.38±9.52	42.86±6.38	0.838 ^{NS}
22nd wk	52.38±7.06	61.90±12.59	47.62±6.02	59.52±7.75	0.564 ^{NS}
23rd wk	35.71±3.19 ^a	64.29±9.58 ^b	76.19±8.78 ^c	57.14±8.24 ^b	4.679 [*]
24th wk	45.24±7.75	69.05±8.58	71.43±8.24	64.29±7.14	2.235 ^{NS}
25th wk	45.24±4.39	35.71±8.03	57.14±10.43	50.00±8.03	1.256 ^{NS}
26th wk	61.90±10.21	64.29±7.14	69.05±11.90	64.29±8.03	0.099 ^{NS}
27th wk	64.29±12.09	71.43±7.37	80.95±6.02	83.33±8.58	0.998 ^{NS}
28th wk	45.24±10.04	76.19±13.12	76.19±15.50	73.81±11.31	1.425 ^{NS}
29th wk	23.81±4.76	19.05±3.01	26.19±9.34	30.95±9.34	0.476 ^{NS}
30th wk	26.19±4.39	23.81±9.52	19.05±4.76	28.57±7.37	0.354 ^{NS}
31st wk	26.19±6.81	38.10±10.21	38.10±8.78	30.95±5.73	0.522 ^{NS}
32nd wk	23.81±4.76	23.81±3.01	33.33±7.06	26.19±7.75	0.573 ^{NS}
33rd wk	28.57±3.68	52.38±8.78	45.24±7.75	45.24±10.70	1.538 ^{NS}
34th wk	19.05±3.01 ^a	26.19±4.39 ^b	40.48±4.39 ^c	45.24±6.81 ^c	6.325 [*]
35th wk	19.05±3.01	35.71±7.14	33.33±6.02	38.10±7.06	2.003 ^{NS}
OVERALL	37.14±3.85	46.67±5.11	51.11±5.13	49.37±4.47	

Table 3: Chemical Composition of *Moringa Oleifera* Leaf Powder (Molp)

Constituents	Amount (per 100g)
Moisture	9
Protein	28.65
Lipid	7.09
Ash	10.9
Carbohydrate	44.36
Calcium(mg)	2.97
Magnesium(mg)	1.9
Zinc	1.58

Table 4: Types of feed offered to the experimental goat

Ingredients	Control Ration (CP%=18.1)	Treatment Ration 1 (CP%=18)	Treatment Ration 2 (CP%= 18.2)	Treatment Ration 3 (CP%=18.1)
Yellow Maize (%)	44	44	44	44
Soybean Cake (%)	20	16	14	11
Wheat Bran (%)	33	27	26	27
Molp (%)	0	10	15	20
Min. Mix (%)	2	2	2	2
Coccidiostat	0.50	0.50	0.50	0.50
Salt (%)	0.50	0.50	0.50	0.50

Conclusion

On the basis of above finding it could be concluded that inclusion of *Moringa oleifera* leaf powder (MOLP) at levels of 15% of the Goats diet improved the growth performance.

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