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

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Rajesh Kumar, Nishant Patel and Mukesh Kumar**

**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 24, 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 upto 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 than that of goats feeding on control diet (0% MOLP).

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 best result on growth performance was shown by the goats fed on 15% MOLP.

**Keywords:** *Moringa oleifera* leaf powder (MOLP), Black Bengal goat, Growth performance

**Introduction**

Goat farming plays a prominent role in the rural economy in supplementing the income of rural household particularly the landless, marginal and small farmers. Goat is considered as poor man's cow and it can be profitably reared with low investment under different systems of management. They provide quick return on account of their short generation intervals, high rate of prolificacy and making the related products. Goats' importance is indicated by various functional contributions like milk, meat, skin, socio-economic relevance, security, income generation, human nutrition and stability of farming system. Goats are the backbone of rural people's economy of arid, semi-arid and hilly regions of our country.

Black Bengal goat is known for its meat quality, so as a meat animal the growth performance is major priority to achieve maximum output from goat industry. Therefore to achieve higher overall meat production in Jharkhand prospective, improvement of growth performance of Black Bengal goat occupies major significance in Jharkhand current scenario.

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.

Several scientific reports has documented improvement in growth performance of food animal by value addition in diet in terms of enriched feed supplements. In feed supplementation, herbal plant addition has an added advantage as it lacks any residual contamination effect. As a herbal plant *Moringa oleifera* (The miracle plant) is having several properties, Which can enhance the growth and reproductive performance and immune status. Thus can act as enhancer of overall growth performance. India is the largest producer of Moringa. Best climatic requirement for growing Moringa is tropical or subtropical. 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 1.25sqm (1.25 m × 1.0 m) under Intensive system of management and provided individual feeders and water buckets.

### 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 were 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 gain 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 were of 120 days.

Data obtained after experiment were analyzed as per the standard statistical methods described by Snedecor and Cochran<sup>[1]</sup> (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 Intensive system of management Significantly higher body wt. was observe from 29<sup>th</sup>-30<sup>th</sup> ( $P \leq 0.01$ ) weeks to 36<sup>th</sup> ( $P \leq 0.05$ ) 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 intensive system of housing were 9.09±0.29, 9.68±0.40, 9.80±0.38, 9.44±0.38 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<sup>[2]</sup> *et al.* (2012) and Tono<sup>3</sup> *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<sup>[4]</sup> *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<sup>[5]</sup> *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<sup>[6]</sup> *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 a irregular increase in body weight gain, seen in all the groups from starting of experiment up to 28<sup>th</sup> 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±4.76 to 83.33±8.58 g in either groups was observed. The overall mean of average daily gain in goats were 35.56±3.23, 47.30±4.54, 47.30±5.52 and 47.30±2.45 g 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 22<sup>nd</sup>, 26<sup>th</sup>, 27<sup>th</sup> and 28<sup>th</sup> weeks 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 28<sup>th</sup> weeks of age may be due to change in ambient temperature during the period of study at that place. The observations revealed 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<sup>[7]</sup> *et al.* (2012), Tona *et al.* (2014) and Bebekar<sup>[8]</sup> 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.

## 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.

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

Age/Treatment	T0	T1	T2	T3	F VALUE
21 <sup>st</sup> week	6.93±0.23	6.87±0.22	7.00±0.17	6.77±0.24	0.202 <sup>NS</sup>
21 <sup>st</sup> -22 <sup>nd</sup> weeks	7.28±0.26	7.18±0.18	7.38±0.23	7.17±0.23	0.188 <sup>NS</sup>
22 <sup>nd</sup> -23 <sup>rd</sup> weeks	7.60±0.24	7.70±0.21	7.92±0.24	7.58±0.25	0.413 <sup>NS</sup>
23 <sup>rd</sup> -24 <sup>th</sup> weeks	7.93±0.27	8.15±0.23	8.30±0.26	7.98±0.26	0.417 <sup>NS</sup>
24 <sup>th</sup> -25 <sup>th</sup> weeks	8.37±0.31	8.53±0.21	8.77±0.22	8.37±0.29	0.514 <sup>NS</sup>
25 <sup>th</sup> -26 <sup>th</sup> weeks	8.70±0.30	8.93±0.18	9.18±0.21	8.77±0.25	0.771 <sup>NS</sup>
26 <sup>th</sup> -27 <sup>th</sup> weeks	8.90±0.28	9.33±0.19	9.72±0.17	9.12±0.25	2.209 <sup>NS</sup>
27 <sup>th</sup> -28 <sup>th</sup> weeks	9.18±0.23	9.75±0.15	9.87±0.17	9.52±0.24	2.186 <sup>NS</sup>
28 <sup>th</sup> -29 <sup>th</sup> weeks	9.40±0.19 <sup>a</sup>	10.30±0.09 <sup>c</sup>	10.40±0.05 <sup>c</sup>	9.73±0.19 <sup>b</sup>	10.087 <sup>**</sup>
29 <sup>th</sup> -30 <sup>th</sup> weeks	9.60±0.19 <sup>a</sup>	10.53±0.14 <sup>c</sup>	10.53±0.06 <sup>c</sup>	10.05±0.14 <sup>b</sup>	9.641 <sup>**</sup>
30 <sup>th</sup> -31 <sup>st</sup> weeks	9.77±0.18 <sup>a</sup>	10.72±0.18 <sup>c</sup>	10.68±0.07 <sup>c</sup>	10.30±0.14 <sup>b</sup>	8.480 <sup>*</sup>
31 <sup>st</sup> -32 <sup>nd</sup> weeks	9.95±0.16 <sup>a</sup>	10.95±0.19 <sup>c</sup>	10.97±0.10 <sup>c</sup>	10.57±0.18 <sup>b</sup>	7.964 <sup>*</sup>
32 <sup>nd</sup> -33 <sup>rd</sup> weeks	10.20±0.13 <sup>a</sup>	11.17±0.21 <sup>c</sup>	11.15±0.12 <sup>c</sup>	10.83±0.21 <sup>b</sup>	6.344 <sup>*</sup>
33 <sup>rd</sup> -34 <sup>th</sup> weeks	10.37±0.12 <sup>a</sup>	11.37±0.20 <sup>c</sup>	11.40±0.15 <sup>c</sup>	11.17±0.19 <sup>b</sup>	7.188 <sup>*</sup>
34 <sup>th</sup> -35 <sup>th</sup> weeks	10.52±0.11 <sup>a</sup>	11.55±0.25 <sup>b</sup>	11.58±0.17 <sup>b</sup>	11.45±0.17 <sup>b</sup>	7.526 <sup>*</sup>
35 <sup>th</sup> -36 <sup>th</sup> weeks	10.67±0.10 <sup>a</sup>	11.83±0.28 <sup>b</sup>	11.97±0.20 <sup>b</sup>	11.73±0.16 <sup>b</sup>	8.728 <sup>*</sup>
OVERALL	9.09±0.29	9.68±0.40	9.80±0.38	9.44±0.38	

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 Intensive System of Management.

AGE/Treatment	T0	T1	T2	T3	F Value
21 <sup>st</sup> week	50.00±6.11	45.24±9.34	54.76±11.31	57.14±7.37	0.363
21 <sup>st</sup> -22 <sup>nd</sup> weeks	45.24±5.73 <sup>a</sup>	73.81±4.39 <sup>c</sup>	76.19±3.01 <sup>c</sup>	59.52±11.31 <sup>b</sup>	4.341 <sup>*</sup>
22 <sup>nd</sup> -23 <sup>rd</sup> weeks	47.62±7.06	64.29±6.11	54.76±10.04	57.14±8.24	1.082
23 <sup>rd</sup> -24 <sup>th</sup> weeks	61.90±11.46	54.76±10.04	66.67±9.52	54.76±6.81	0.368
24 <sup>th</sup> -25 <sup>th</sup> weeks	47.62±9.52	57.14±11.06	59.52±9.34	57.14±8.24	0.303
25 <sup>th</sup> -26 <sup>th</sup> weeks	28.57±5.21 <sup>a</sup>	57.14±10.43 <sup>b</sup>	76.19±11.46 <sup>c</sup>	50.00±10.91 <sup>b</sup>	4.003 <sup>*</sup>
26 <sup>th</sup> -27 <sup>th</sup> weeks	40.48±11.31 <sup>b</sup>	59.52±7.75 <sup>c</sup>	21.43±3.19 <sup>a</sup>	57.14±10.43 <sup>c</sup>	4.053 <sup>*</sup>
27 <sup>th</sup> -28 <sup>th</sup> weeks	30.95±8.58 <sup>a</sup>	78.57±10.91 <sup>b</sup>	76.19±19.04 <sup>b</sup>	30.95±8.58 <sup>a</sup>	4.574 <sup>*</sup>
28 <sup>th</sup> -29 <sup>th</sup> weeks	28.57±6.38	33.33±7.96	19.05±3.01	45.24±11.31	1.964
29 <sup>th</sup> -30 <sup>th</sup> weeks	23.81±3.01	26.19±6.81	21.43±3.19	35.71±9.58	0.995
30 <sup>th</sup> -31 <sup>st</sup> weeks	26.19±5.73	33.33±3.01	40.48±6.81	38.10±7.96	1.045
31 <sup>st</sup> -32 <sup>nd</sup> weeks	35.71±6.11	30.95±4.39	26.19±5.73	38.10±7.96	0.728
32 <sup>nd</sup> -33 <sup>rd</sup> weeks	23.81±4.76	28.57±5.21	35.71±10.26	47.62±7.06	2.090
33 <sup>rd</sup> -34 <sup>th</sup> weeks	21.43±4.87	26.19±5.73	26.19±4.39	40.48±7.75	2.000
34 <sup>th</sup> -35 <sup>th</sup> weeks	21.43±3.19	40.48±10.04	54.76±6.81	40.48±11.31	2.619
OVERALL	35.56±3.23	47.30±4.54	47.30±5.52	47.30±2.45	

**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
Soyabean 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

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