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**Dr. Manmohan Kumar**  
Touring Veterinary Officer,  
Department of Animal  
Husbandry, Patna, Bihar, India

**Dr. Nirmala Minj**  
Assistant Professor Cum Junior  
Scientist, Department of  
Livestock Production and  
Management, Ranchi Veterinary  
College, Kanke, Ranchi,  
Jharkhand, India

**Dr. Sushil Prasad**  
Professor, Department of  
Livestock Production and  
Management, Ranchi Veterinary  
College, Kanke, Ranchi,  
Jharkhand, India

**Dr. Rajesh Kumar**  
Ph.D. Scholar, Department of  
Livestock Products Technology,  
Bihar Veterinary College, Patna,  
Bihar, India

**Dr. Anju Kujur**  
Ph.D. Scholar ICAR-IVRI,  
Izzatnagar, Uttar Pradesh, India

**Dr. Sweta Kumari**  
Teaching Associate, Department  
of Veterinary Microbiology,  
R.V.C, Kanke, Ranchi,  
Jharkhand, India

**Dr. Nishant Patel**  
Assistant Professor Cum Junior  
Scientist, Department of  
Livestock Production and  
Management, Ranchi Veterinary  
College, Kanke, Ranchi,  
Jharkhand, India

**Corresponding Author**  
**Dr. Manmohan Kumar**  
Touring Veterinary Officer,  
Department of Animal  
Husbandry, Patna, Bihar, India

## Comparative study on effect of feeding *Moringa oleifera* leaf powder on growth performance of growing female black Bengal goat under intensive and semi-intensive system of management

**Dr. Manmohan Kumar, Dr. Nirmala Minj, Dr. Sushil Prasad, Dr. Rajesh Kumar, Dr. Anju Kujur, Dr. Sweta Kumari and Dr. Nishant Patel**

### 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 Forty eight, 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 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. Along with these the goats reared under semi-intensive system of management showed better growth performance over the intensive system of management.

**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. 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 19<sup>th</sup> census 2012 India contributes about 135.17 million to the world's goat population and occupies 2<sup>nd</sup> 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 (*Capra hircus 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.*) [1]. It's 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 Moringaceae. It is locally known as Munga or Sahjan. One such plant is *Moringa oleifera*, commonly known as the drumstick tree (Makker and Becker 1997) [2]. There are about 13 species of *Moringa* trees in the family Moringaceae. 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) [3]. The leaf extract was found to regulate cholesterol level in rats. 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 1.25 sqm (1.25 m × 1.0 m) and 1.75sqm (1.75 m × 1.0 m) under Intensive and semi-intensive system of management respectively and provided individual feeders and water buckets. The goats were allowed 10 days of adjustment period during which they were gradually introduced to the experimental diets.

### Experimental procedure and design

A total of forty-eight 4 to 5 months old female goats were allocated. All the goats were divided equally into two groups and reared under Intensive and semi-intensive systems of management. 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. 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 feed conversion ratio (FCR) were calculated as a proportion of live weight gain to days of feeding during experimental period. The duration of the feeding trial were of 120 days.

## Result and Discussion

### Body Weight

The body weights of each goat from all the groups were recorded at weekly interval during the experimental period and is presented in (Table 1 and 3).

All the groups under study exhibited 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 under both the system of housing 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 whereas in case of cage system of management average body weight were found to be significant higher from 28<sup>th</sup> weeks to 35<sup>th</sup> ( $P \leq 0.05$ ) and 36<sup>th</sup> weeks ( $P \leq 0.01$ ) of age.

The effect of MOLP on average body weight under different systems of management was found significantly ( $P \leq 0.05$ ) higher for goats reared under Semi-intensive system of management at 28<sup>th</sup> to 30 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 whereas in case of semi-intensive system it was found to be 9.26±0.32, 9.86±0.40, 9.94±0.44 and 9.67±0.42 kg for T0, T1, T2 and T3 groups respectively. 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 *et al.* 2012) [4] and Tono *et al.* (2014) [5] as they recorded better gain in body weight of goats fed on diets with inclusion of *Moringa oleifera*. However the result obtained by Sarwatt *et al.* (2002) [6] 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 *et al.* (2015) [7] 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 *et al.*, (2014) [8] 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 as well as more physical activity of goats under semi-intensive system of management as compared to intensive system.

**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 wt. 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	

Each value is the average of 6 observations.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , NS = Non-Significant

**Table 3:** 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
21 <sup>st</sup> wk	7.03±0.23	7.15±0.18	6.95±0.19	6.85±0.11	0.454 <sup>NS</sup>
22 <sup>nd</sup> wk	7.32±0.25	7.42±0.20	7.32±0.17	7.15±0.10	0.327 <sup>NS</sup>
23 <sup>rd</sup> wk	7.68±0.28	7.85±0.15	7.65±0.15	7.57±0.13	0.385 <sup>NS</sup>
24 <sup>th</sup> wk	7.93±0.28	8.30±0.13	8.18±0.16	7.97±0.14	0.812 <sup>NS</sup>
25 <sup>th</sup> wk	8.25±0.24	8.78±0.10	8.68±0.18	8.42±0.15	1.780 <sup>NS</sup>
26 <sup>th</sup> wk	8.57±0.24	9.03±0.06	9.08±0.16	8.77±0.18	1.797 <sup>NS</sup>
27 <sup>th</sup> wk	9.00±0.25	9.48±0.06	9.57±0.09	9.22±0.13	2.738 <sup>NS</sup>
28 <sup>th</sup> wk	9.45±0.22 <sup>a</sup>	9.98±0.06 <sup>b</sup>	10.13±0.06 <sup>b</sup>	9.80±0.08 <sup>b</sup>	5.376 <sup>*</sup>
29 <sup>th</sup> wk	9.77±0.24 <sup>a</sup>	10.52±0.07 <sup>b</sup>	10.67±0.06 <sup>b</sup>	10.32±0.06 <sup>b</sup>	8.519 <sup>*</sup>
30 <sup>th</sup> wk	9.93±0.24 <sup>a</sup>	10.65±0.07 <sup>b</sup>	10.85±0.06 <sup>c</sup>	10.53±0.04 <sup>b</sup>	8.660 <sup>*</sup>
31 <sup>st</sup> wk	10.12±0.24 <sup>a</sup>	10.82±0.07 <sup>b</sup>	10.98±0.04 <sup>c</sup>	10.73±0.06 <sup>b</sup>	7.890 <sup>*</sup>
32 <sup>nd</sup> wk	10.30±0.26 <sup>a</sup>	11.08±0.09 <sup>b</sup>	11.25±0.09 <sup>c</sup>	10.95±0.06 <sup>b</sup>	7.630 <sup>*</sup>
33 <sup>rd</sup> wk	10.47±0.25 <sup>a</sup>	11.25±0.10 <sup>c</sup>	11.48±0.09 <sup>c</sup>	11.13±0.08 <sup>b</sup>	8.484 <sup>*</sup>
34 <sup>th</sup> wk	10.67±0.26 <sup>a</sup>	11.62±0.14 <sup>c</sup>	11.80±0.09 <sup>c</sup>	11.45±0.12 <sup>b</sup>	8.391 <sup>*</sup>
35 <sup>th</sup> wk	10.80±0.28 <sup>a</sup>	11.80±0.09 <sup>b</sup>	12.08±0.10 <sup>c</sup>	11.77±0.15 <sup>b</sup>	8.830 <sup>*</sup>
36 <sup>th</sup> wk	10.93±0.26 <sup>a</sup>	12.05±0.19 <sup>b</sup>	12.28±0.07 <sup>c</sup>	12.03±0.16 <sup>b</sup>	10.493 <sup>**</sup>
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 4:** 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
21 <sup>st</sup> week	40.48±5.73	38.10±4.76	52.38±9.52	42.86±6.38	0.838 <sup>NS</sup>
21 <sup>st</sup> -22 <sup>nd</sup> weeks	52.38±7.06	61.90±12.59	47.62±6.02	59.52±7.75	0.564 <sup>NS</sup>
22 <sup>nd</sup> -23 <sup>rd</sup> weeks	35.71±3.19 <sup>a</sup>	64.29±9.58 <sup>b</sup>	76.19±8.78 <sup>c</sup>	57.14±8.24 <sup>b</sup>	4.679 <sup>*</sup>
23 <sup>rd</sup> -24 <sup>th</sup> weeks	45.24±7.75	69.05±8.58	71.43±8.24	64.29±7.14	2.235 <sup>NS</sup>
24 <sup>th</sup> -25 <sup>th</sup> weeks	45.24±4.39	35.71±8.03	57.14±10.43	50.00±8.03	1.256 <sup>NS</sup>
25 <sup>th</sup> -26 <sup>th</sup> weeks	61.90±10.21	64.29±7.14	69.05±11.90	64.29±8.03	0.099 <sup>NS</sup>
26 <sup>th</sup> -27 <sup>th</sup> weeks	64.29±12.09	71.43±7.37	80.95±6.02	83.33±8.58	0.998 <sup>NS</sup>
27 <sup>th</sup> -28 <sup>th</sup> weeks	45.24±10.04	76.19±13.12	76.19±15.50	73.81±11.31	1.425 <sup>NS</sup>
28 <sup>th</sup> -29 <sup>th</sup> weeks	23.81±4.76	19.05±3.01	26.19±9.34	30.95±9.34	0.476 <sup>NS</sup>
29 <sup>th</sup> -30 <sup>th</sup> weeks	26.19±4.39	23.81±9.52	19.05±4.76	28.57±7.37	0.354 <sup>NS</sup>
30 <sup>th</sup> -31 <sup>st</sup> weeks	26.19±6.81	38.10±10.21	38.10±8.78	30.95±5.73	0.522 <sup>NS</sup>
31 <sup>st</sup> -32 <sup>nd</sup> weeks	23.81±4.76	23.81±3.01	33.33±7.06	26.19±7.75	0.573 <sup>NS</sup>
32 <sup>nd</sup> -33 <sup>rd</sup> weeks	28.57±3.68	52.38±8.78	45.24±7.75	45.24±10.70	1.538 <sup>NS</sup>
33 <sup>rd</sup> -34 <sup>th</sup> weeks	19.05±3.01 <sup>a</sup>	26.19±4.39 <sup>b</sup>	40.48±4.39 <sup>c</sup>	45.24±6.81 <sup>c</sup>	6.325 <sup>*</sup>
34 <sup>th</sup> -35 <sup>th</sup> weeks	19.05±3.01	35.71±7.14	33.33±6.02	38.10±7.06	2.003 <sup>NS</sup>
Overall	37.14±3.85	46.67±5.11	51.11±5.13	49.37±4.47	

**Table 5:** Effect of MOLP on average body weight (kg) of black Bengal goat under different systems of management

Age/housing system	Intensive system	Semi-intensive system	F value
21 <sup>st</sup> week	6.89±0.10	7.00±0.09	0.563 <sup>ns</sup>
21 <sup>st</sup> -22 <sup>nd</sup> weeks	7.25±0.10	7.30±0.09	0.102 <sup>ns</sup>
22 <sup>nd</sup> -23 <sup>rd</sup> weeks	7.70±0.11	7.69±0.09	0.007 <sup>ns</sup>
23 <sup>rd</sup> -24 <sup>th</sup> weeks	8.09±0.12	8.10±0.09	0.001 <sup>ns</sup>
24 <sup>th</sup> -25 <sup>th</sup> weeks	8.51±0.12	8.53±0.09	0.024 <sup>ns</sup>
25 <sup>th</sup> -26 <sup>th</sup> weeks	8.90±0.12	8.86±0.09	0.047 <sup>ns</sup>
26 <sup>th</sup> -27 <sup>th</sup> weeks	9.27±0.12	9.32±0.08	0.107 <sup>ns</sup>
27 <sup>th</sup> -28 <sup>th</sup> weeks	9.58±0.10	9.84±0.07	3.759 <sup>ns</sup>
28 <sup>th</sup> -29 <sup>th</sup> weeks	9.96±0.11 <sup>a</sup>	10.32±0.09 <sup>b</sup>	6.062 <sup>*</sup>
29 <sup>th</sup> -30 <sup>th</sup> weeks	10.18±0.10 <sup>a</sup>	10.49±0.09 <sup>b</sup>	4.866 <sup>*</sup>
30 <sup>th</sup> -31 <sup>st</sup> weeks	10.37±0.07 <sup>a</sup>	10.66±0.09 <sup>b</sup>	4.372 <sup>*</sup>
31 <sup>st</sup> -32 <sup>nd</sup> weeks	10.61±0.11	10.90±0.10	3.423 <sup>ns</sup>
32 <sup>nd</sup> -33 <sup>rd</sup> weeks	10.84±0.11	11.08±0.10	2.444 <sup>ns</sup>
33 <sup>rd</sup> -34 <sup>th</sup> weeks	11.08±0.12	11.38±0.12	3.252 <sup>ns</sup>
34 <sup>th</sup> -35 <sup>th</sup> weeks	11.28±0.12	11.61±0.13	3.364 <sup>ns</sup>
35 <sup>th</sup> -36 <sup>th</sup> weeks	11.55±0.14	11.83±0.13	1.890 <sup>ns</sup>
Overall	9.50±0.36	9.68±0.39	

Each value is the average of 6 observations.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , NS = Non-Significant

**Table 6:** Effect of MOLP on average daily wt. gain (g) of black Bengal goat under different systems of management

Age/housing system	Intensive system	Semi-intensive system	F value
21 <sup>st</sup> week	51.79±4.19	43.45±3.38	2.390
21 <sup>st</sup> -22 <sup>nd</sup> weeks	63.69±4.12	55.36±4.23	1.986
22 <sup>nd</sup> -23 <sup>rd</sup> weeks	55.95±3.32	58.33±4.78	0.167
23 <sup>rd</sup> -24 <sup>th</sup> weeks	59.52±4.60	62.50±4.28	0.224
24 <sup>th</sup> -25 <sup>th</sup> weeks	55.36±4.57	47.02±4.07	1.849
25 <sup>th</sup> -26 <sup>th</sup> weeks	52.98±5.79	64.88±4.46	2.645
26 <sup>th</sup> -27 <sup>th</sup> weeks	44.64±5.18 <sup>a</sup>	75.00±4.40 <sup>b</sup>	19.921 <sup>**</sup>
27 <sup>th</sup> -28 <sup>th</sup> weeks	54.17±7.59	67.86±6.50	1.874
28 <sup>th</sup> -29 <sup>th</sup> weeks	31.55±4.12	25.00±3.46	1.478
29 <sup>th</sup> -30 <sup>th</sup> weeks	26.79±3.13	24.40±3.27	0.276
30 <sup>th</sup> -31 <sup>st</sup> weeks	34.52±3.09	33.33±3.90	0.057
31 <sup>st</sup> -32 <sup>nd</sup> weeks	32.74±3.03	26.79±2.89	2.014
32 <sup>nd</sup> -33 <sup>rd</sup> weeks	33.93±3.82	42.86±4.21	2.461
33 <sup>rd</sup> -34 <sup>th</sup> weeks	28.57±3.10	32.74±3.15	0.887
34 <sup>th</sup> -35 <sup>th</sup> weeks	39.29±4.65	31.55±3.21	1.873
Overall	44.37±3.21	46.07±4.37	

Each value is the average of 6 observations.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , NS = Non-Significant

**Table 7:** 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 8:** 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

### 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. Along with the above findings semi-intensive system of management showed better growth performance over intensive system of management.

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