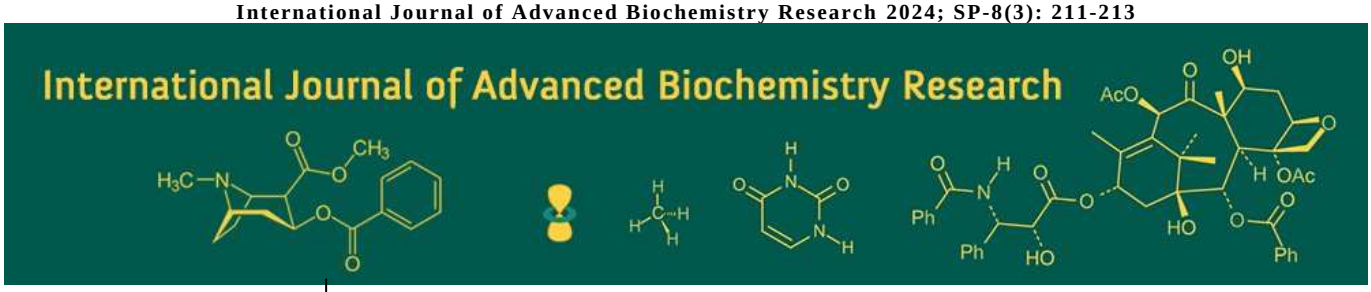

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Study on effect of feeding *Moringa oleifera* leaf powder on weight gain of growing female black Bengal goat under intensive system of management

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Abstract
The present research work was designed to evaluate the daily weight gain (gms) 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 upto 9 months of age. The investigation of above research work showed that goats fed on diets containing *Moringa oleifera* leaf powder (MOLP) gains higher body weight gain per day than that of goats feeding on control diet (0% MOLP). 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 T_0, T_2, T2 and T_3 groups respectively. 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, body weight gain

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. 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) [1]. There are about 13 species of Moringa trees in the famiy *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, Sreelatha and Padma, 2009) [2]. The major component of essential oil in Moringa leaf were pentacosane, hexacosane, E-phytol and 1-(2,3,6 trimethyphenly)-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.

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

Statistical analysis
Statistical analysis of data were done as per the methods suggested by Snedecor and Cochran (2004) [3] by using IBM SPSS (Statistical Package for the Social Sciences) statistics software.

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 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: T_2 = 100% concentrate mixture + 0% MOLP T2 = 90% concentrate mixture + 10% MOLP, T_3 = 85%, concentrate mixture + 15% MOLP, T_4 = 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 duration of the feeding trial were of 120 days

Results and Discussion

Body Weight Gain

The average daily body weight gain(g) was calculated for every weekly interval using the observations of body weight at previous and current weekly intervals. The observations of calculated average daily body weight gain (ADG) at various weekly intervals are presented in (Table 1.) and are depicted graphically in (Fig.1).

The results shows no definite trend in increase in average daily gain in all the groups, however there was a irregular increase in body weight gain, seen in all the groups under both the system of housing 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±4.76 to 83.33±8.58 g in either groups and 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 T_0, T_2, T2 and T_3 groups respectively which also reflects non significant difference in average body weights gain of all the groups whereas in case of semi-intensive system it was found to be 37.14±3.85, 46.67±5.11, 51.11±5.13 and 49.37±4.47 g for T_0, T_2, T2 and T_3 groups respectively, however under intensive system of management the ADG was seen significantly ($P \leq 0.05$) different at 22nd, 26th,27th and 28th weeks of age but in case of semi-intensive system it was found to be significantly ($P \leq 0.05$) different at 23rd and 34th weeks of age.

The effect of MOLP on average body weight gain under different systems of management was found significantly ($P \leq 0.01$) higher for goats reared under Semi-intensive system of management at 27th 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 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) [4] 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) [2], Tona *et al.* (2014) [5] and Bebekar and Bdalbagi (2015) [6] 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 daily WT. Gain (g) of black Bengal goat under intensive system of management

Age/Treatment	T_0	T_2	T2	T_3	F Value
21st week	50.00±6.11	45.24±9.34	54.76±11.31	57.14±7.37	0.363
21st -22nd weeks	45.24±5.73^a	73.81±4.39^c	76.19±3.01^c	59.52±11.31^b	4.341*
22nd -23rd weeks	47.62±7.06	64.29±6.11	54.76±10.04	57.14±8.24	1.082
23rd -24th weeks	61.90±11.46	54.76±10.04	66.67±9.52	54.76±6.81	0.368
24th -25th weeks	47.62±9.52	57.14±11.06	59.52±9.34	57.14±8.24	0.303
25th -26th weeks	28.57±5.21^a	57.14±10.43^b	76.19±11.46^c	50.00±10.91^b	4.003*
26th -27th weeks	40.48±11.31^b	59.52±7.75^c	21.43±3.19^a	57.14±10.43^c	4.053*
27th -28th weeks	30.95±8.58^a	78.57±10.91^b	76.19±19.04^b	30.95±8.58^a	4.574*
28th -29th weeks	28.57±6.38	33.33±7.96	19.05±3.01	45.24±11.31	1.964
29th -30th weeks	23.81±3.01	26.19±6.81	21.43±3.19	35.71±9.58	0.995
30th -31st weeks	26.19±5.73	33.33±3.01	40.48±6.81	38.10±7.96	1.045
31st -32nd weeks	35.71±6.11	30.95±4.39	26.19±5.73	38.10±7.96	0.728
32nd -33rd weeks	23.81±4.76	28.57±5.21	35.71±10.26	47.62±7.06	2.090
33rd -34th weeks	21.43±4.87	26.19±5.73	26.19±4.39	40.48±7.75	2.000
34th -35th 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

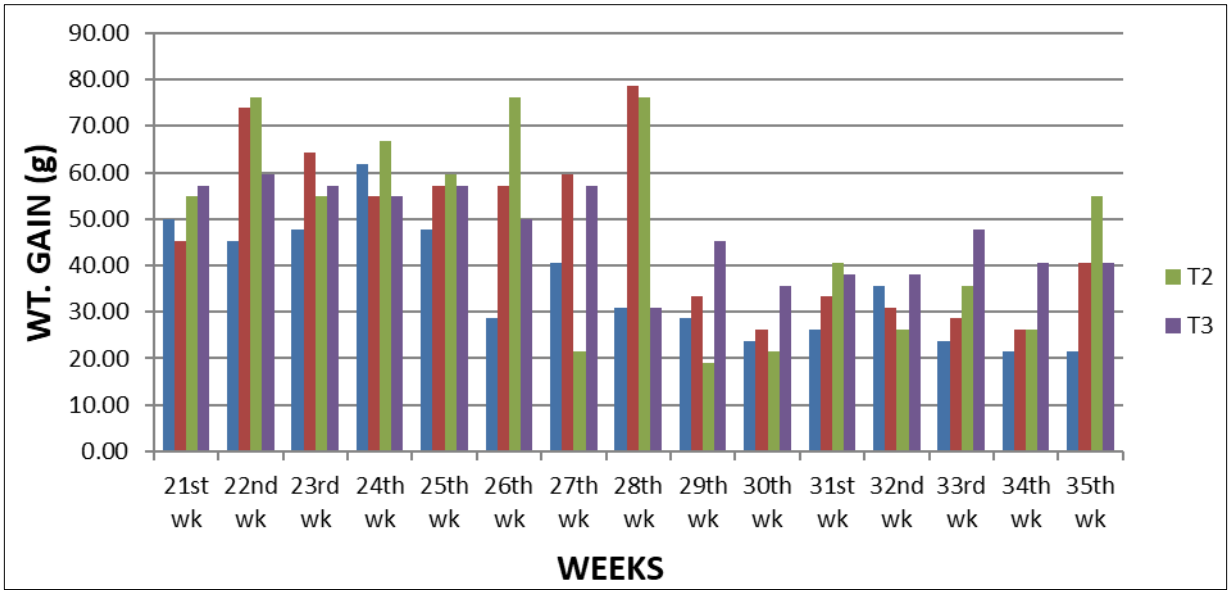

Fig 1: Effect of MOLP on average daily wt. gain (g) of black Bengal goat under intensive system of management

Table 2: Chemical composition of *moringa oleifera* leaf powder (MOLP)

Constituents	Amount (per 100 g)
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 3: 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

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

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