RESEARCH ARTICLE

Effect of Feeding *Moringa oleifera* Meal on Growth Performance of Growing Surti Kids under Intensive System of Management

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Abstract

A 14 weeks study was carried out on eighteen Surti kids of 6-8 months of age. The kids were randomly divided into three treatment groups, with six in each group based on the same age and uniform conformation to evaluate the effect of *Moringa oleifera* meal (MOM) on growth performance. After 15 days of the adaptation period, kids were offered total mixed ration (TMR) by replacing commercial concentrate with MOM at 0, 25, and 50 % inclusion rates by maintaining a constant protein level in all the dietary rations. The results showed that kids fed on three different inclusion rates of *M. oleifera* meal in concentrate did not reveal significant differences in their overall body weight, total body weight gain, and biometry (body length and heart girth), except height at wither, which was significantly ($p < 0.05$) higher at 50 % of inclusion rate as compared to 25 % of inclusion rate. The average daily body weight gain was significantly ($p < 0.05$) higher at 25 % MOM inclusion. It was concluded that feeding MOM by replacing commercial concentrate mixture does not impair overall body weight and biometry and improves the average daily body weight gain of Surti kids. The best result on growth performance was shown by the goats fed on 25 % MOM.

Keywords: Growth performance, *M. oleifera* meal (MOM), Surti kids.

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Introduction

The impact of global warming on agriculture in tropical countries like India is a major threatening issue on animals and humans. Varying environmental temperature leads to a substantial shortage in feed and fodder production. Today, India is facing a deficit of 11.24 % in green fodder, 23.49 % in dry fodder, and 28.9 % in concentrate feed (Roy *et al*., 2019). On the other hand, as per 20th livestock census, 4.6 % increase in livestock population is reported over the previous census (GOI, 2019), which further expands the gap between availability and demand of livestock feed and fodder. To increase the availability of feed resources for increasing livestock population, inclusion of non-conventional feed resources in livestock ration can be done, reducing the production cost without impairing the growth performance of animals. Indian farmers generally practice the use of non-conventional feed resources (NCFR) during scarcity periods for decades, but the incorporation of NCFR for the long term can affect the growth and production performance of animals due to the presence of various anti-nutritional factors.

One potential non-conventional forage is M. oleifera, which grows throughout the tropics (Debela and Tolera, 2013) and is an indigenous native tree from India. Moreover, it can be grown in humid, hot, dry tropical, and subtropical regions. *M. oleifera* leaves are a good source of protein, vitamin B, vitamin C, vitamin K, provitamin A as beta-carotene, and minerals like manganese with a negligible amount of anti-nutritive factors (Moyo *et al.,* 2012). The use of *M. oleifera* leaves gained popularity in animal ration because it is a perennial plant and several harvests can be obtained in one growing season; *M. oleifera* leaves can be fed fresh or dried without any loss in its nutritive value and is a good source of protein. *Moringa* foliage has been evaluated to a limited degree in terms of a supplementary feed to enhance the production performance of goats. Therefore,

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the present study was undertaken to determine the effect of incorporating different levels of *M. oleifera* meal in the ratio of Surti kids on their growth performance.

Materials and Methods

For fourteen weeks, the present study was conducted at Livestock Farm Complex (LFC), College of Veterinary Science and AH, Anand. Animal care, handling, and sampling procedures were approved by the Institutional Animal Ethics Committee (IAEC). A total of eighteen (18) growing Surti kids of 6-8 months of age and an average body weight of 7-14 kg were selected. They were dewormed initially and were managed under standard intensive management practices in separate pens. The experimental animals were distributed equally and randomly on body weight basis in three treatment groups with six kids in each group (4 females and 2 males), *viz.,* T_1: TMR having roughage 65 % and compound concentrate mixture 35 %, T_2: TMR with 25 % compound concentrate mixture replaced by *M. oleifera* meal and T_3: TMR with 50 % compound concentrate mixture replaced by *M. oleifera* meal. The *M. oleifera* meal consisted of 78 % *M. oleifera* dry leaves (CP % = 28.6) and 22 % *M. oleifera* stem powder (CP % = 12.5) to produce 100 % *M. oleifera* meal. The mineral mixture was offered to the experimental animals at the rate of 2 % of feed offered. The weighed quantity of TMR was offered daily in morning (8.00 a.m.) and afternoon (3.00 p.m.) individually (ICAR, 2013). The *ad lib* quantity of wholesome clean water was offered daily in the morning and afternoon.

Daily and fortnightly feed intake and fortnightly body weights were recorded and thereby average daily gain in weight was calculated of each animal. Biometry of kids included body length, heart girth, and height at withers recorded fortnightly by squarely placing the animals on leveled ground. Data obtained after the experiment were analyzed using a factorial completely randomized design (Snedecor and Cochran, 1994).

Results and Discussion

Body Weight

The fortnightly body weights of kids under dietary treatment of different levels of *M. oleifera* meal are presented in Table 1. In the present study, all the treatment groups exhibited a similar fortnightly increase in the average body weight throughout the experimental duration, indicating linear growth among the dietary groups. The body weights of the T_2 group were numerically higher than that of T_1 and T_3 groups within each period. The mean body weights of Surti kids under an intensive housing system were 11.88 ± 0.36, 12.06 ± 0.33 and 11.79 ± 0.27 kg for T1, T2, and T3 dietary respectively, which reflects comparable average body weights among the experimental groups. The results obtained in the present study were in agreement with the findings of Sarwatt *et al.* (2002), Mahmoud (2013), and Kumar *et al.* (2018). They reported similar non-significant differences in the overall body weights of experimental lambs and kids under different inclusion rates of *M. oleifera*. However, the present findings disagreed with the results obtained in various other studies that the *M. oleifera* feeding significantly ($p < 0.05$) increased the body weight of growing kids (Tona *et al.,* 2014), Bengal kids 4-5 months old (Sultana *et al.*, 2015[b]) and crossbred kids (Anglo Nubian × local) of 7-9 months age (Aregheore, 2002). The present results revealed that 0, 25, and 50 % inclusion of *M. oleifera* in concentrate does not affect the body weight of growing Surti kids, which may be due to the equal protein level in all three experimental groups TMRs.

Average Daily Gain in Body Weight (ADG)

The present findings showed a significantly ($p < 0.05$) higher ADG in T_2, while T_1 and T_3 were at par. No definite trend in ADG was observed within the period. The mean ADGs of Surti kids under an intensive system of housing was 18.96 ± 0.86, 22.14 ± 1.22, and 18.33 ± 0.94 g for T_1, T_2 and T_3 dietary groups, respectively (Table 2). These findings were

Table 1: Effect of *M. oleifera* meal on fortnightly body weight (kg) of experimental kids

	Treatment & Body weight (kg)		
Period	T_1	T_2	T_3
P_1	11.06 ± 0.99	11.08 ± 0.84	10.99 ± 0.71
P_2	11.35 ± 0.99	11.42 ± 0.85	11.26 ± 0.71
P_3	11.62 ± 0.98	11.75 ± 0.86	11.54 ± 0.71
P_4	11.90 ± 1.00	12.08 ± 0.88	11.81 ± 0.72
P_5	12.16 ± 1.01	12.39 ± 0.89	12.05 ± 0.74
P_6	12.41 ± 1.02	12.68 ± 0.91	12.32 ± 0.76
P_7	12.63 ± 1.02	12.97 ± 0.93	12.58 ± 0.79
Mean (T)	11.88 ± 0.36	12.06 ± 0.33	11.79 ± 0.27

Note: None of the groups or periods influenced the average fortnightly body weight of kids

Table 2: Effect of *M. oleifera* meal on average daily body weight gain of experimental kids

	Treatment & ADG (g)		
Period	T_1	T_2	T_3
P_1	18.93 ± 2.80	19.88 ± 3.75	14.76 ± 1.69
P_2	20.95 ± 2.73	24.52 ± 3.26	18.93 ± 2.15
P_3	19.40 ± 2.55	23.21 ± 3.76	19.88 ± 2.37
P_4	19.40 ± 2.56	23.81 ± 3.49	19.52 ± 2.73
P_5	18.81 ± 1.76	22.02 ± 2.98	17.26 ± 3.06
P_6	17.98 ± 1.84	20.95 ± 3.53	19.05 ± 3.11
P_7	17.26 ± 2.36	20.60 ± 3.06	18.93 ± 2.80
Mean (T)	18.96^b ± 0.86	22.14^a ± 1.22	18.33^b ± 0.94

Means with different superscripts (a, b) within the row differ significantly ($p < 0.05$).

Table 3: Effect of *M. oleifera* meal on biometry of experimental kids

	Treatment and Biometry (cm)		
Character	T_1	T_2	T_3
Height at withers (cm)	$53.31^{ab} \pm 0.56$	$51.82^{b} \pm 0.62$	$53.71^{a} \pm 0.74$
Body Length (cm)	47.96 ± 0.71	49.00 ± 0.52	48.63 ± 0.56
Heart Girth (cm)	53.09 ± 0.43	52.87 ± 0.58	48.63 ± 0.49

Means with different superscripts (a, b) within the row differ significantly ($p < 0.05$).

in accordance with Aregheore (2002), where 20 % inclusion of *M. oleifera* in forage showed significantly ($p < 0.05$) higher ADG over 0 and 50 % inclusion. Mahmoud (2013), however observed insignificantly higher ADG in growing lambs at 25 % *M. oleifera* inclusion rate in concentrate. In earlier studies, a non-significant difference was observed in ADG at 50 % *M. oleifera* inclusion in concentrate as compared to control by Ali (2017) and at 25, 50, and 75 % inclusion by Sultana *et al*. (2015[a]), which partially agreed with the present findings. Mataveia *et al*. (2019) observed non-significant differences at 50, 75 and 100 % *M. oleifera* inclusion in place of concentrate mixture, while higher ADG at 50 % inclusion was observed by Damor *et al*. (2017).

In present findings, higher ADG observed at 25 % inclusion of *M. oleifera* meal treated group may be due to the higher quality by-pass protein in *M. oleifera* leaf meal (Makkar and Becker, 1996). However, the high level of M. oleifera forage in the diets comprises various anti-nutritional compounds, such as phytates, tannins, cyanide, and oxalates, which may affect digestion, metabolism and absorption of nutrients in animals which lead to reduced body weight gain at 50 % or higher inclusion rates. This reduction in growth performance parameters might be due to the reducing digestibility of crude protein (Zaher *et al*., 2020).

Biometry

Perusal of the data presented in Table 3 revealed that the body length and heart girth of experimental kids were comparable among treatment groups. However, height at withers was significantly ($p < 0.05$) higher in the T_3 group (53.71 ± 0.74 cm) as compared to T_2 (51.82 ± 0.62 cm), with an intermediate value of T_1 group (53.52 ± 0.56 cm).

The present findings are in accordance with the observations of Srivastav (2018) and Bhokre *et al.* (2020), where no significant difference in heart girth of animals was observed when fed on *M. oleifera* leaves as compared to control. However, the present findings disagreed with the report of Bhokre *et al.* (2020), who reported no significant difference in the height of kids at withers, whereas body length was significantly ($p < 0.05$) higher in *M. oleifera* fed groups.

Conclusion

In brief, the study indicated that 25 % inclusion of *M. oleifera* meal in concentrate mixture improved the growth performance of Surti kids under an intensive system of management.

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